

Enterprise IP Solutions

OfficeServ 7400

General Description

The Samsung logo, consisting of the word "SAMSUNG" in white, bold, sans-serif capital letters, centered within a dark blue oval.

SAMSUNG



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ELECTRONICS

EU Declaration of Conformity

Samsung Electronics Co., Ltd.

259 Gongdan-Dong, Gumi-City Kyungbuk, Korea, 730-030

(factory name, address)

declare under our sole responsibility that the product

Digital Keyphone System model "OfficeServ 7400"

to which this declaration relates is in conformity with

**Low Voltage Directive 73/23/EEC
EMC Directive 89/336/EEC:92/31/EEC**



By application of the following standards

EN55022: 1998 +A1:2000+A2:2003

EN55024: 1998 +A1:2001+A2:2003

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Intended Use

This telephone system is intended to provide the user with voice communication between the system extensions and connection to the public switched telephone network by digital or analogue links.

The telephone system may be provided with the ability to communicate with local computer networks to provide CTI functions and features. In this case, it is capable of passing information to the computer network via a specified link.

The system is powered by mains voltage and can optionally be powered by batteries. Details of all connections and power arrangements are provided in the instructions for use. It should not be used in any other way.

INTRODUCTION

Purpose

This guide provides comprehensive descriptions of the hardware configurations, specifications and business functions of the Samsung Enterprise Solutions OfficeServ 7400 key telephone system.

Guide Content and Organization

This guide contains four chapters and a section on abbreviations used in the guide.

CHAPTER 1. Overview of OfficeServ 7400

Provides an overview of the possible system configurations, interfaces and programming requirements.

CHAPTER 2. OfficeServ 7400 Hardware

Describes the hardware in detail, including chassis and hardware module configurations and functions. It also covers station, wireless and other equipment available for use with the OfficeServ 7400.

CHAPTER 3. OfficeServ 7400 Specifications

Details the system capacity, electrical standard, power standard, ring / tone, and equipment specifications for the system.

CHAPTER 4. OfficeServ 7400 Functions

Describes the available keyphone functions including Call, VoIP, Data, Unified Messaging Service (UMS) and Web and System management provided by OfficeServ 7400.

ABBREVIATIONS

Explains the abbreviations used in this guide.

Conventions

The following paragraph types contain special information that you should carefully read and thoroughly understand. Such information may or may not be enclosed in a rectangular box, separating it from the main text, but is always preceded by an icon and/or a bold title.



NOTE

Indicates additional information as a reference.

Reference

OfficeServ 7400 Installation Guide

Describes the conditions necessary for installing the OfficeServ 7400 system, the installation procedures, and how to operate and maintain the system correctly.

OfficeServ 7400 Programming Guide

Provides comprehensive instructions for programming your OfficeServ 7400 system using MMC programs.

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CHAPTER 1. Overview of OfficeServ 7400

This chapter provides an overview of the features and functions of OfficeServ 7400 and discusses the basic system configurations, interfaces and programming requirements.

1.1 Introduction to System

OfficeServ 7400 is designed to meet the needs of mid- to large-sized offices and provides advanced functions including voice, data and internet functions. OfficeServ 7400 also provides a data exchange function using the data network as well as the voice call function. Users enjoy a variety of phone and call-handling features and applications employing standard phones, digital phones, IP phones, mobile phones, PCs and servers.

1.1.1 Main Functions

The main functions and features of the keyphone system are:

Integrated Communication Environment

OfficeServ 7400 provides data transmission using the Local Area Network (LAN), Wide Area Network (WAN) modules and the voice call function. Users can easily communicate using both wireless and wired integrated equipment (telephones, PCs, wireless phones and peripherals).

Next-generation Platform

OfficeServ 7400 provides a genuine IP solution integrating mail servers, and Voice over IP Unified Messaging Service (VoIP UMS) functions via IP-based feature servers. The IP-based feature server is a Linux platform that can add feature server modules to be provided in the future.

High Quality IP Phone Function

OfficeServ 7400 ensures the Quality of Service (QoS) of the voice calls depending on the priorities and grouping of data and voice packets:

- Layer 2 QoS: Priority Processing (802.1p), VLAN(802.1q)
- Layer 3 QoS: Class Based Queuing (CBQ), Real-time Transmission Protocol (RTP) Priority Queuing, On-Demand Bandwidth management for WAN.

WAN and LAN Functions

OfficeServ 7400 is equipped with WAN and LAN interface modules so that it can exchange data with the external Internet and internal Intranet via 10/100 BASE-T or 1000 BASE-TX/SX/LX interfaces without additional data equipment.

Wireless LAN Service

OfficeServ 7400 provides a wireless LAN solution for wireless/wired complex services within the office. It uses either a Combo Access Point (AP) that serves separated data and voice or a Basic AP that serves combined data and voice, and supports ‘hand-off’ and QoS. Since OfficeServ 7400 uses a wireless LAN Access Point (AP), it allows users to make wireless/wired voice/data communication and to access the Internet.

An efficient and convenient working environment can be created at any time or in any place through the use of sophisticated mobile stations.

Text-To Speech (TTS) Response

OfficeServ 7400 converts text messages, such as e-mails, to voice messages and allows users to listen to the messages through phones.

Mail Server and Instant Messaging

OfficeServ 7400 integrates voice messages and e-mails to function as a mail server, which converts the integrated messages depending on the users’ needs and resends them, and sends/receives instant messages.

A Variety of Application Solutions

OfficeServ 7400 offers a variety of applications such as OfficeServ News, OfficeServ EasySet, Internet Call Center, R-NMS, On-module Voice Mail Solutions, Integrated Fax Server, and Digital Integrated Recording Systems.



NOTE

Integrated and Application Solution

- ‘Integrated’ means that the OfficeServ 7400 system works together with an external server as one integrated unit.
- For more detailed information on how to use a particular application, refer to the User’s Guide supplied with the application.

Convenient Installation and Expandability

OfficeServ 7400 can be quickly and easily installed. The basic chassis and expansion chassis are installed in a 19-inch rack. Multiple service modules are mounted in the universal slots of the chassis.

1.1.2 System Architecture

OfficeServ 7400 is configured with a basic chassis and expansion chassis installed in the 19-inch rack, and the OfficeServ feature server installed on an external Linux server. The Main Control Processor (MP40) module is installed in the basic chassis and manages the overall operation of the system. The Line Control Processor (LP 40), the sub-control module installed in the expansion chassis, controls other modules and sends/receives data to/from the MP40. The other components are interface modules, the power supply, and a fan.

OfficeServ 7400 comprises five main functional units:

- Call Server: Module for voice services such as MP40, LP40, TEPRI, MGI, DLI, SLI, Trunk
- Data Server: Module for data services (GWIM, GSIM, GLIMP, PLIM, LIM)
- Feature Server: Linux application for IP voice services such as OfficeServ VoIP UMS
- OfficeServ Admin: PC application to manage the Call Server (such as OfficeServ EasySet, WebMMC, OfficeServ Manager)
- OfficeServ Solution: PC application to manage high-class voice services that are linked with the Call Server (such as OfficeServ Call and Operator)

The service configuration of the system is shown in the figure below:

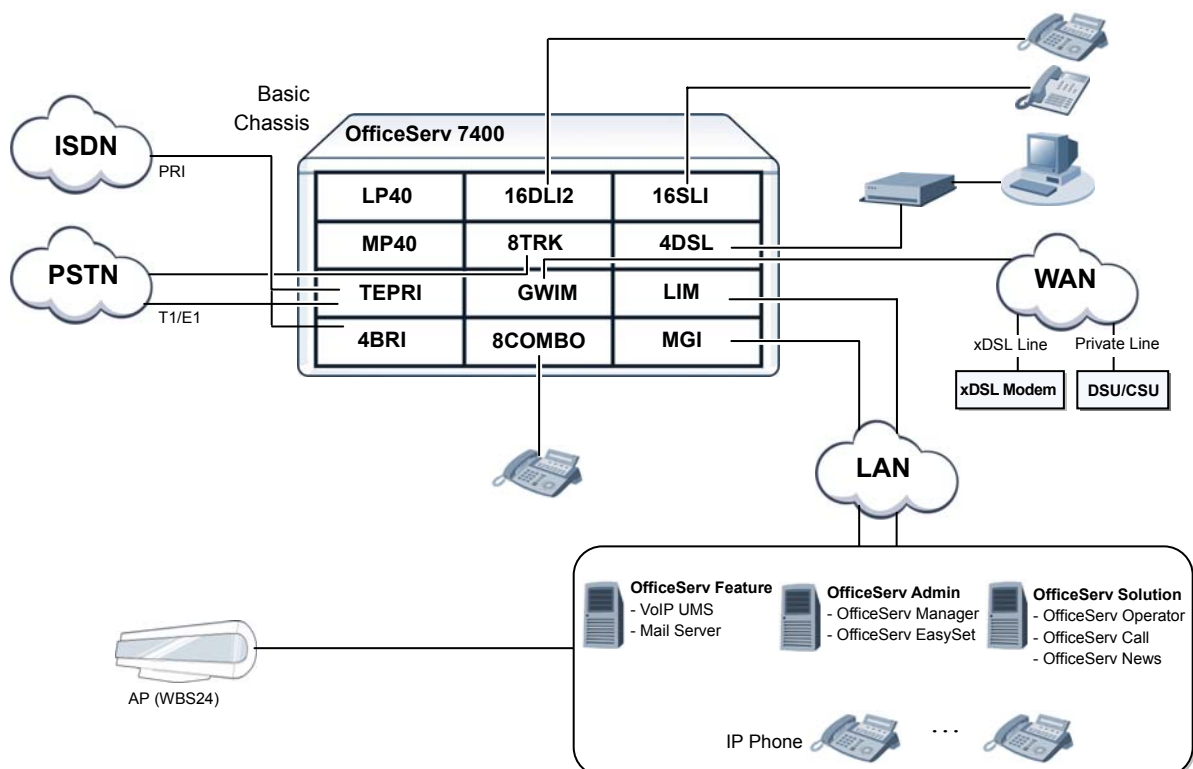


Figure 1.1 Configuration of OfficeServ 7400 Services

Voice Trunk Line Component

The voice trunk line component is configured with digital trunk lines and analogue trunk lines. T1E1PRI (TEPRI)/TEPRI2 functions as an E1, T1 and Primary Rate Interface (PRI) digital trunk line module, sends/receives voice data through the trunk line and transmits the information at 64 kbps per channel. The 8Trunk (8TRK) functions as Polarity Reverse Detection (PRS) and Caller ID (CID) provides the Metering Pulse Detection function option. In addition, it sends/receives voice data as analogue trunk lines and transmits the information at 64 kbps per channel.

Voice Station Component

The voice station component is configured with Digital Line Interface (DLI) (digital stations) and Subscriber Line Interface (SLI) (analogue stations) and provides voice services. Multiple station modules can be installed depending on the combination of port numbers and stations. Digital stations have the 16DLI2 and 8DLI modules; analogue stations have the 16SLI module.

Additionally, there is the 8COMBO, a combination of analogue and digital stations.

Data Transmission Component

The data module is configured with the GWIM, a WAN interface module, and the LIM/PLIM/GLIMP/GSIM LAN interface modules. The LIM/PLIM modules send or receive data to/from the internal Intranet, provide a 10/100 BASE-T interface and function as a switching hub. The PLIM module provides the Integrated Power over Ethernet (PoE) function.

The GPLIM module provides the Layer 2 LAN interface to support internal data networks and serves the 10/100 BASE-T Fast Ethernet (FE) and 1000 BASE-TX/SX/LX interface for data transmission.

The GSIM module provides the Gigabit LAN interface of Layer 2 and Layer 3 to support data networks and serves the 1000 BASE-TX/SX/LX interface. The GWIM, a module for data communication with the external Internet, provides the WAN interface to support data networks. The 4 Digital Subscriber Line (4DSL) module provides services to data subscribers up to 1 km away from the internal Intranet. Subscribers can use Ethernet services within the transmission distance of 1 km.



NOTE

Abbreviations of Data Server Module Names

GWIM: Gigabit WAN Interface Module

LIM: LAN Interface Module

PLIM: PoE LAN Interface Module

GPLIM?: Gigabit PoE LAN Interface Module

GSIM: Gigabit Switch Internet Module

Voice Application Component

The voice application module consists of the Voice over Internet Protocol (VoIP) that transmits voice to the data network and the Wireless Local Area Network (WLAN) that transmits voice wirelessly. The Media Gateway Interface (MGI)/Media Gateway Interface 64-channel (MGI64) module offers the VoIP function by converting voices into data. The 4 Wireless LAN Interface (4WLI) module uses Digital Adaptor for Subscriber Loop (DASL) to connect to a wireless AP and sends/receives voice to/from the phone system and wireless AP. The 4WLI module supports up to four APs (WBS24 Combo) and the OfficeServ 7400 system accommodates up to 16 x 4WLI modules and 640 subscribers.

Configuration of the Application

The OfficeServ 7400 has a commercial server on a Linux platform outside of the chassis and provides the application software indicated below. OfficeServ Solution and OfficeServ Admin have separate servers.

- Mail Server
- VoIP Unified Messaging Service (UMS)
- OfficeServ Solution (CTI, OfficeServ Operator)
- OfficeServ Admin (Web Management, OfficeServ Manager, OfficeServ EasySet, System Manager)

1.2 Interfaces

This section describes the interfaces between the sub-modules of OfficeServ 7400 and between the VoIP elements.

1.2.1 Interfaces between Sub-modules

Table 1.1 Interfaces between Sub-Modules

Categories	Types	Interfaces
LIM/PLIM Interface	Physical Access	IEEE 802.3 10 BASE-TX, IEEE 802.3u 100 BASE-TX
	Connector Type	RJ-45
GPLIM Interface	Physical Access	IEEE 802.3 10 BASE-TX, IEEE 802.3u 100 BASE-TX, IEEE 802.3z 1000 BASE-SX/LX, IEEE 802.3ab 1000 BASE-TX
	Connector Type	RJ-45, SFP (Small Form-factor Pluggable Connector)
GSIM Interface	Physical Access	IEEE 802.3z 1000 BASE-SX/LX, IEEE 802.3ab 1000 BASE-TX
	Connector Type	SFP (Small Form-factor Pluggable Connector)
GWIM Interface	Physical Access	IEEE 802.3z 1000 BASE-SX/LX, IEEE 802.3ab 1000 BASE-TX, V.35(T1/E1), HSSI(T3/E3)
	Connector Type	SFP, Serial 26-pin connector (non-standard cable), Serial 50-pin connector
	Access Protocol	- PPPoE (PPP over Ethernet), PPP (Point to Point Protocol) - DHCP (Dynamic Host Configuration Protocol) - HDLC (High-level Data Link Control) - Frame Relay
PSTN Interface	Physical Access	T1, E1, FXO (Foreign Exchange Office)
	Connector Type	RJ-45
	Access Protocol	T1, E1, Loop Start
ISDN Interface	Physical Access	ISDN PRI
	Connector Type	RJ-45
	Access Protocol	ISDN PRI
xDSL/Cable Modem Interface	Physical Access	IEEE 802.3u 100 BASE-TX Ethernet
	Connector Type	RJ-45
	Access Protocol	PPPoE and DHCP
Voice Terminal Interface	Analogue Phone	FXS (Foreign Exchange Station)
	Digital Phone	Samsung Digital Phone
	Wireless LAN AP (Access Point)	802.11b, WBS24 (Samsung Wireless LAN AP)

Table 1.1 Interface between Sub-Modules (Continued)

Categories	Types	Interfaces
Interface between Call Server and Data Server (GWIM, GSIM, GPLIM)	Physical Access	DPRAM (Dual Port RAM)
	Signal Process	IPC (Inter-Processor Communication) Message
	Access Protocol	Samsung Proprietary Message IPC
Interface between Call Server and System Manager	Physical Access	100 BASE-TX Ethernet
	Signal Process	TCP/IP
	Access Protocol	TCP, UDP IPC
Interface between Data Server and Feature Server	Physical Access	100 BASE-TX Ethernet
	Signal Process	TCP/IP
	Access Protocol	DHCP
Interface between Data Server and System Manager	Physical Access	100 BASE-TX Ethernet
	Signal Process	TCP/IP
	Access Protocol	TCP, UDP IPC
Interface between Feature Server and System Manager	Physical Access	100 BASE-TX Ethernet
	Signal Process	TCP/IP
	Access Protocol	TCP, UDP IPC

1.2.2 Interfaces between VoIP Components

OfficeServ 7400 provides various VoIP interfaces as follows:

- VoIP Networking
- H.323 VoIP Gateway
- SIP VoIP Gateway
- System SIP User Agent (UA)
- IP Telephone

For signal processing, the interface standards between VoIP components are as follows:

- Proprietary TCP Inter-Processor Communication (IPC)
- SIP UA-to-UA

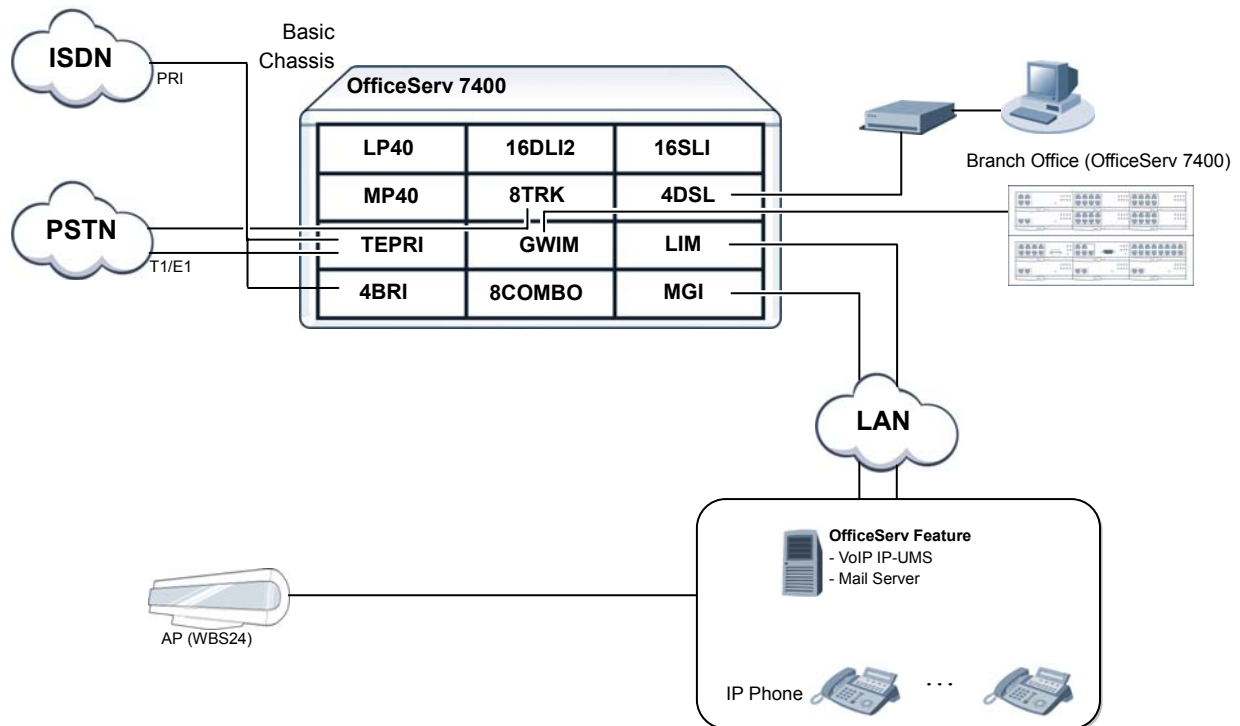


Figure 1.2 Interfaces between VoIP Components

1.3 Programming

Samsung's Man Machine Communication (MMC) programs are used to set and change the data values for system operation. MMCs operate at three levels: technician (or system), administrator (or operator/customer), and subscriber (or station user). Access to an MMC may be controlled by a password depending on its action: a password is required for technician-level programming and administrator-level programming but not for subscriber-level programming.

Technician-Level Programming

Programming can be done from any digital display phone. Simultaneous programming from more than one phone is not allowed.

Administrator-Level Program

The administrator can program only those MMCs specified in MMC 802 by the system installer (technician). Programming can be done from any digital display phone. Simultaneous programming from more than one phone is not allowed.

Subscriber Level Program

Only the subscriber's phone can be programmed at this level.

CHAPTER 2. OfficeServ 7400 Hardware

This chapter describes the hardware in detail, including chassis configurations and module functions and configurations. In addition, it describes terminals, wireless LAN equipment, and additional equipment available for the OfficeServ 7400.

Hardware is installed as described in the *OfficeServ 7400 Installation Guide* provided with your system.

2.1 Hardware Features

OfficeServ 7400 hardware has the following features:

Safety

The materials and components used are robust and satisfy all mechanical and electrical requirements for communication systems.

- The chassis comply with the industrial standards and are assembled using robust and stable metal welding.
- The hardware does not generate poisonous or corrosive gas, which might be harmful to humans or affect the system operation.
- Materials are used which eliminate Electro-Magnetic Interference (EMI).
- The hardware has a failure-tolerance to protect the system from the damage caused by over-voltage.
- Ensure that system power is switched OFF when installing and uninstalling modules.

Modularity

The hardware has functional modules.

- Each module can be easily installed or removed.

Maintenance

The hardware is designed to be maintained with ease and safety.

- The 19-inch rack is designed to maintain sufficient strength.
- Installers and maintainers can connect/disconnect cables easily because the connection ports are placed on the front panel.
- The front of each module has LEDs that indicate failures or operational status so that the operator can easily identify what is happening.
- The back of the rack has a grounding hole to which a wrist strap for preventing static electricity can be connected.
- The hardware is designed to protect electronic devices from damage caused by factors in the external environment during installation and maintenance.

Fire Resistance and Heat Processing

The hardware is made of fire-resistant materials. Heat generated from inside the system does not affect performance.

- Temperature-sensitive components are protected from heat-generating components.
- Four fans (80 mm) for cooling are installed to extract heated air to the outside.
- The components installed in modules are located on the basis of heat distribution.

2.2 Chassis Configuration

OfficeServ 7400 comprises a basic chassis and one or two expansion chassis installed in a 19-inch rack. A functional server operates externally. The Main Control Processor (MP40) module is installed in the basic chassis; it manages the overall operation of the OfficeServ 7400 and performs switching, signal processing and subscriber station management functions. The LP40, the sub-control processor module, is installed in the basic or expansion chassis; it controls various line modules and sends/receives information to/from the MP40. The other components are interface modules, the power supply, and fans.

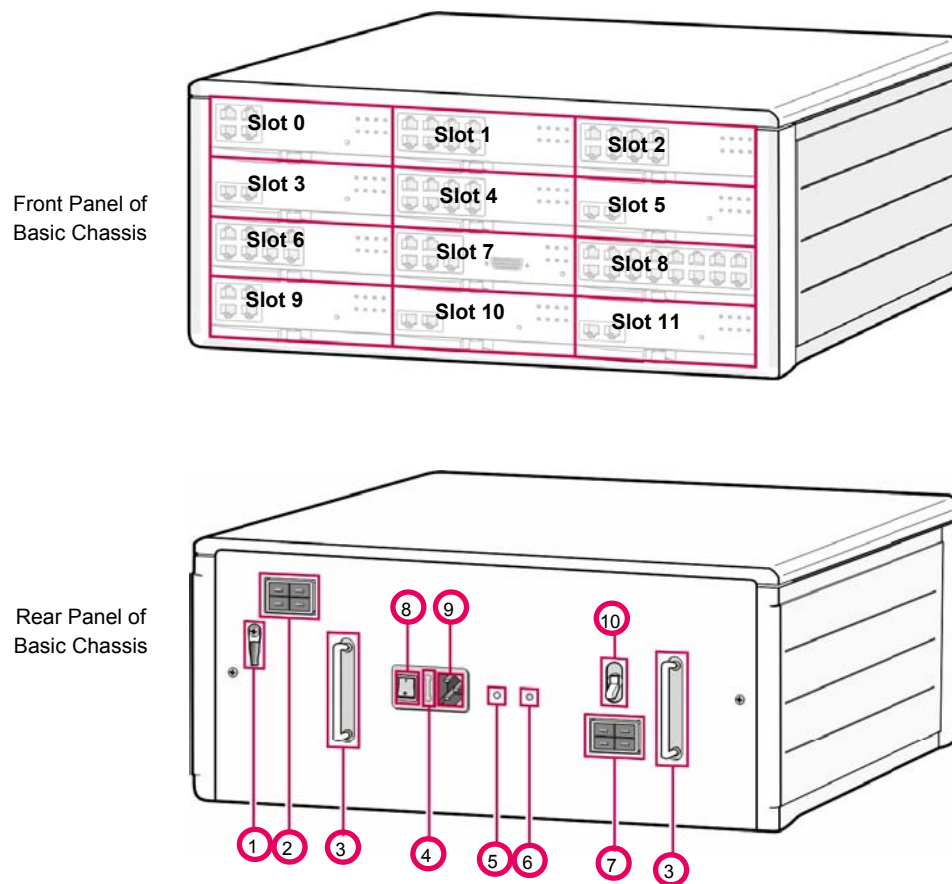


Figure 2.1 Basic Chassis Configuration

Table 2.1 Rear Panel of OfficeServ 7400 Basic Chassis

No.	Component	Function
1	Ground Lug	Lug for grounding system communication
2	Connector for External Rectifier	To supply external power for PoE (Power over Ethernet)
3	Handle	To use while mounting/removing a power module
4	Fuse Holder	Fuse for AC input power
5	AC LED	The LED turns on while applying AC power.
6	DC LED	The LED turns on while the DC power is operating.
7	Battery Socket	Socket to connect an external battery
8	Power I/O Connector	Connector for power cable
9	Power Switch	System power switch
10	Battery Switch	Switch to supply battery power to the OfficeServ 7400 or charge the battery.

2.2.1 Configuration of Slots

The basic chassis and expansion chassis each have 12 slots in which modules can be mounted. The modules mounted depend on the configuration of the OfficeServ 7400 (see Table 2.2).

Table 2.2 Mountable Modules

Chassis	Slots	Mountable Modules
Basic Chassis (OfficeServ Access)	Slot 0	LP40
	Slot 3	MP40
	Slot 1 and 2 Slot 4~11	All Modules except MP40 and LP40
Expansion Chassis (OfficeServ Expansion)	Slot 0	LP40
	Slot 1~11	All Modules except MP40 and LP40

If using the total capacity of TEPRI2 and MGI64, a basic chassis that supports 64 channels per slot is used.

**NOTE**

Blank Module

A Blank Module is a dummy module that functions as a screen to prevent ingress of unwanted material into a slot when it is not being used.

2.3 Modules by Function

Table 2.3 shows the function of each available module.

Table 2.3 Modules by Function

Functions	Modules
Main Control	Basic Chassis: MP40 (Option Module: Modem) Any Chassis: LP40 (Option Module: SCM, RCM2, MFM, CRM and MIS)
Voice Trunk Line	TEPRI, TEPRI2, 4BRI and 8TRK
Voice Station	16DLI2, 8DLI, 16MWSLI and 8COMBO
Data	4DSL, LIM, PLIM, GPLIM, GSIM and GWIM (Option Module: GWIMS)
Voice Application	4WLI, MGI (Option Module: MGI2D), MGI64
Power, Fan	PSU and Fan

2.3.1 Control Modules

This section describes the configuration and functions of the MP40 and LP40 control modules.

2.3.1.1 MP40 (Main Control Module)

MP40 is the main control module for all functions of the OfficeServ 7400 and is mounted in slot 3 of the basic chassis. The MP40:

- performs voice switching and signal processing;
- controls subscribers' station management functions;
- performs system booting and data management functions;
- recognizes/monitors/controls the modules mounted in the universal slot of the expansion chassis through IPC by connecting to the LP40 in the expansion chassis of the OfficeServ 7400, or the LCP in the expansion chassis of an OfficeServ 7200.

The MP40 is connected to the LAN Interface Module (LIM) via the LAN Interface on the front panel to drive various applications. The flexibility of the system is improved by accommodating the VoIP function, and the load on the system is balanced by using a control module for each chassis. IPC between chassis uses the HDLC protocol to increase the reliability.

Main Functions

The MP40 module offers the following functions:

- Various application operations via the LAN interface
- Convenient installation via Smart Media
- Database backup
- Port for Universal Asynchronous Receiver and Transmitter (UART) test
- External/Internal Music On Hold (MOH) and Loud/Common Bell functions
- Time setup and display function
- Digital Phase Locked Loop (DPLL) for synchronization with digital subscribers

Option Module (Modem)

The MP40 module can optionally support a Modem module.

- The MP40 module can support the Modem daughterboard module that is commonly used with the OfficeServ 500 and 100 systems. Ensure that the Modem module is correctly mounted on the MP40 module.
- The Modem module operates via a V.23 interface and supports the V.90 protocol. OfficeServ 7400 controls the Modem module via serial communication using standard AT commands.

Specification

The specifications of the MP40 control module are as follows:

Table 2.4 Specifications of MP40 Module

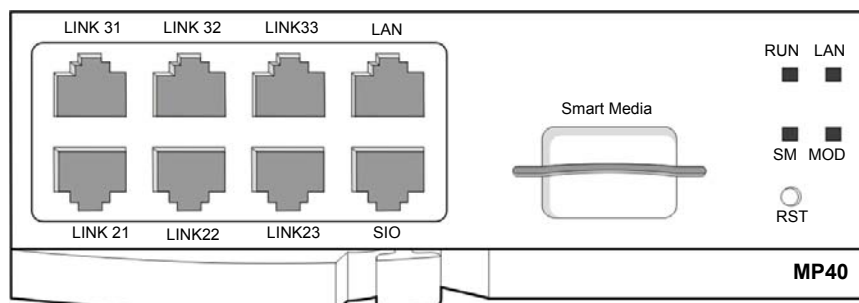
Categories	Names	Standards
CPU	Processor	MPC8271ZQMIBA
	System Clock	66 MHz
	Package	516 BGA
SDRAM (Memory for programs and data)	Capacity	128 MB (32 MB * 4 EA), 256 MB extendable
	Width of Data Bus	64 bit
SRAM (Memory for Data, Backup)	Capacity	2 MB (1 MB * 2 EA)
	Width of Data Bus	32 bit
Flash ROM (For Booting)	Capacity	1 MB (512 KB*2 EA)
	Width of Data Bus	8 bit

Table 2.4 Specifications of MP40 Module (Continued)

Categories	Names	Standards
Time Switch	Device	ZL50018
	Basic Switch	2048 x 2048 Channel
	Data Bus Width	16 bit
RTC	Device	EPSON_8563BN
	Time for Backup	24 Hours
SmartMedia (Memory for programs and data)	Capacity	32 MB
	Width of Data Bus	8 bit
NAND Flash ROM (Data memory)	Device	K9F2808U0C
	Capacity	16 MB
EEPROM Data memory (example: MAC Address)	Capacity	1 KB
	Interface	SPI
Engine	Device	STL7065A
	Width of Data Bus	8 bit

Front Panel

The front panel of the MP40 module is shown below.

**Figure 2.2 Front Panel of MP40 Module**

The components on the front panel of the MP40 module have the following functions:

Table 2.5 Front Panel of MP40 Module

Ports and LEDs	Functions
LINK21~LINK23	Connection port between MP40 and LP40 in the first expansion chassis
LINK31~LINK33	Connection port between MP40 and LP40 in the second expansion chassis
LAN	Port to connect 10/100 BASE-T LAN
SIO	UART Port (for test) and CPLD JTAG Port (for management)
RST	Button for MP40 module reset
Smart Media	Port to mount NAND-type Flash memory

Table 2.5 Front Panel of MP40 Module (Continued)

Ports and LEDs	Functions
RUN LED	Status of MP40 operation - Off: No power - On (Green): Booting - Blink (Green): Normal Operation (The blink cycle is 500 ms while running software)
LAN LED	Status of LAN operation - Off: No power and no connection of LAN port - On: The colour of the LED shows the LAN transmission speed and connection speed. • On (Green): Good connection + Operation at 100 Mbps - Blink (Green): Good connection + Operation at 10 Mbps
SM LED	Smart Media Access Status - Off: No Smart Media - On: The colour of the LED shows the installed status and operational status after access. • On (Green): Installed and normal operation • On (Red): Not installed, or installed but operating abnormally - Blink (Green): Smart Media is installed and in access mode.
MOD LED	The installed status and operational status of the Modem - Off: No MODEM installed - On (Green): MODEM installed - Blink (Green): Transmitting data

2.3.1.2 LP40 (Sub-Control Module)

LP40 is mounted in slot 0 of the basic and expansion chassis. LP40 manages subscriber modules and terminals, under the overall control of the MP40, and transfers various event signals generated in these modules and terminals to the MP 40.

Three optional modules can be mounted on the LP40 module. The functions of the optional modules are DTMF, R2, CID, Conference and MISC.

Main Functions

The LP40 module provides the following functions:

- Provides LAN Interfaces (Testing Port)
- Provides testing ports for Universal Asynchronous Receiver and Transmitter (UART)
- Conference, caller information, multi-frequency detecting and door phone control
- Internal/external Music On Hold (MOH) and Loud/Common Bell

Optional Modules

The optional modules available to mount on the LP40 module are the MFM, MIS, RCM2, SCM and CRM modules.

- **Multi-Frequency Module (MFM):** MFM contains ASIC chips for detecting DTMF signals. It can detect DTFM signals from 12 channels simultaneously. MFM is installed in LOC1 or LOC2 of the LP40 (the location is indicated on the LP40 module).
- **Miscellaneous (MIS):** MIS provides the external hold sound source input ports, external paging ports, loud bell ports and common bell ports. Two dry ports connect or block the power supply and signal transfers with external devices. MIS is installed in LOC3 of the LP40 module (the location is indicated on the LP40 module).
- **R2 CID Module 2 (RCM2):** RCM2 detects and generates Caller Identification (CID) from 14 channels. It selects an operation mode (detection and generated signal) as R2 or CID using a switch in the module. It is installed in LOC1 or LOC2 of the LP40 module (the location is indicated on the LP40 module).

Note: The R2 function is not currently available but is planned for a future release.

- **Switch Conference Module (SCM):** SCM performs the Conference function. Up to 12 groups can hold conferences (max. five persons per group). SCM detects DTFM signals transmitted from 12 channels. It is installed in LOC1 or LOC2 of the LP40 module (the location is indicated on the LP40 module)
- **Common Resource Module (CRM):** CRM detects and generates DTMF signals and CID signals. It is installed in LOC1 or LOC2 of the LP 40 module (the location is indicated on the LP40 module).

Specifications

The specifications of the LP40 are shown in Table 2.6.

Table 2.6 Specifications of LP40 Module

Category	Name	Standard
CPU	Processor	MPC852T
	System Clock	50 MHz
	Package	256P PBGA
SDRAM (For program and data storage)	Capacity	16 MB
	Data Bus Width	32 bit
Flash ROM (For data storage)	Capacity	4 MB
	Data Bus Width	16 Bit
Boot ROM (For booting)	Capacity	512 KB
	Data Bus Width	8 Bit
Rate Conversion Digital Switch	Rate	2.048 ↔ 8.192 Mb/s
	Data Bus Width	16 Bit
Others	Internal MOH Port	1 port
	External MOH Port	2 ports

Front Panel

The front panel of the LP40 module is shown below:

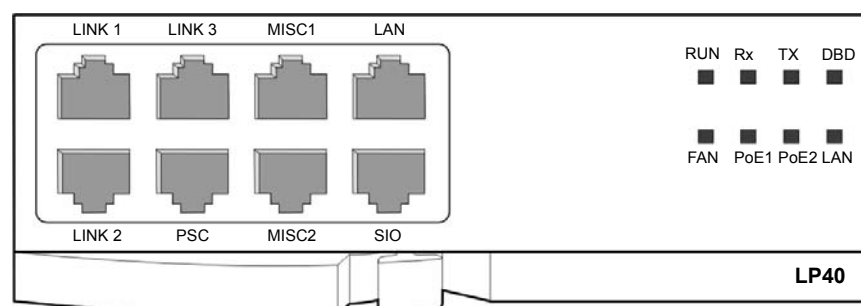


Figure 2.3 Front Panel of LP40 Module

The components on the front panel have the following functions:

Table 2.7 Front Panel of LP40 Module

Port / LED	Function Description
LINK1~LINK3	Ports for connecting MP40 and LP40
MISC1~MISC2	Ports for connecting external music, paging, loud bell, common bell and door bell
PSC	Connection port for PoE power status check
LAN	Port for connecting 10/100 BASE-T LAN (for testing)
SIO	UART port (for testing), CPLD JTAG port (for management)
RST	Button for resetting LP40 module
RUN LED	Indicates the status of LP40. - Off: No power supplied or abnormal status - Orange Blink: Booting - Green Blink: Normal status
Rx LED	Indicates the status related to data receipt in communication with MP40. - Off: No signal - Green Blink: Data reception in progress
TX LED	Indicates the status related to data transmission in communication with MP40 - Off: No signal - Green Blink: Data transmission in progress
DBD LED	Indicates the daughterboard status. - Off: No daughterboard - Green On: One daughterboard installed
FAN LED	Indicates the operation of Fan. - Green On: All Fans normal - Red Blink: One or more Fans abnormal
PoE1 LED	Indicates the status of PoE1 power supply. - Off: No PoE1 power supply - Green On: Normal - Red Blink: Abnormal
PoE2 LED	Indicates the status of PoE2 power supply. - Off: No PoE2 power supply - Green On: Normal - Red Blink: Abnormal
LAN LED	Indicates the status of the LAN. - Off: LAN disconnected - Green Blink: Operating at 10 Mbps - Green On: Operating at 100 Mbps

2.3.2 Voice Trunk Line Module

This section describes the modules offering the voice service of trunk lines.

2.3.2.1 TEPRI

The T1E1PRI (TEPRI) module provides the digital trunk line. A TEPRI module provides E1, T1, ISDN and PRI, and functions as the Q-SIG. This module transmits voice via the trunk line and a channel transmits the voice data at 64 Kbps.

Main Functions

The TEPRI voice trunk line module performs the following functions:

- Selects function for T1/E1/PRI signal processing through programming
- A resistance circuit that satisfies both T1 (100 Ω) and E1 (120 Ω)
- Surge protection (International Telecommunication Union (ITU) standard)
- Output port protection for line monitors
- Jitter function that satisfies ITU-T I.431 and G.703
- Selectable line codecs (HDB3, AMI)
- Local/remote loop
- HDLC or Common Associated Signalling (CAS) through Common Channel Signalling (CCS)

Specifications

The specifications of the TEPRI voice trunk line module are as follows:

- E1: 30 channels
- T1: 24 channels
- PRI: 30 channels

Front Panel

The front panel of the TEPRI voice trunk line module is shown below:



Figure 2.4 Front Panel of TEPRI Module

The components on the front panel of the TEPRI module have the following functions:

Table 2.8 Front Panel of TEPRI Module

Port / LED	Function Description
T1/E1/PRI	Ports for connecting T1/E1/PRI cables
SIO	UART port (for testing)
RST	Button for resetting TEPRI module
SYNC LED	Clock Synchronization - On: the circuit is receiving the clocking signal and is synchronised - Off: the circuit is not receiving the clocking signal and is not synchronised
LOS LED	Signal loss generation - On: Signal loss generated - Off: No signal loss generated
AIS LED	T1/E1 remote alarm generation - On: Remote alarm generated - Off: No remote alarm generated
L2 LED	Layer 2 operation - On: PRI Layer2 operation normal - Off: PRI Layer2 operation abnormal
IPC LED	Interface with upper module - On: Working with LP40 - Off: Not working with LP40
CLK LED	This LED indicates whether this module is a master or slave. - On: The module is receiving the clock signal from the network and is the master clock source for the system. - Off: The module is not receiving the clock signal from the network OR it is not the master clock source for the system.
TP1 LED	T1 connection - LED turns on when connected with T1
TP2 LED	PRI connection - LED turns on when connected with PRI

2.3.2.2 TEPRI2

TEPRI2 provides the digital trunk line. A TEPRI2 module provides two ports for E1, T1, ISDN and PRI respectively, and functions as the Q-SIG. This module transmits voice via the trunk line and a channel transmits the voice data at 64 Kbps.

Main Functions

The TEPRI2 voice trunk line module performs the following functions:

- Selects function for T1/E1/PRI signal process through programming
- A resistance circuit that satisfies both T1(100 Ω) and E1(120 Ω)
- Surge protection (International Telecommunication Union (ITU) standard)
- Output port protection for line monitors
- Jitter function that satisfies ITU-T I.431 and G.703
- Selectable line codecs (HDB3, AMI)
- Local/remote loop
- HDLC or Common Associated Signalling(CAS) through Common Channel Signalling (CCS)

Specifications

The specifications of the TEPRI2 voice trunk line module are as follows:

- Two trunk line ports
- E1: 30 channels per port
- T1: 24 channels per port
- PRI: 30 channels per port

Front Panel

The front panel of the TEPRI2 voice module is shown below:

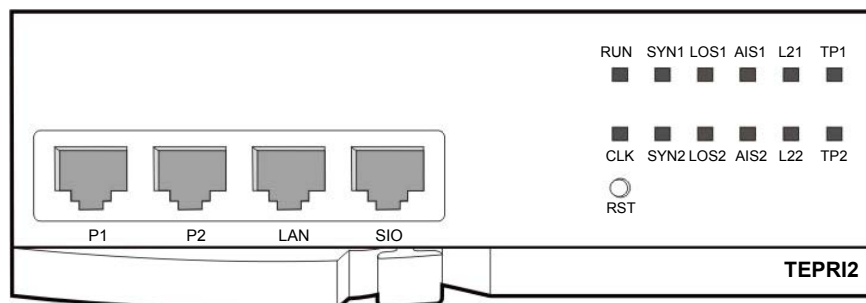


Figure 2.5 Front Panel of TEPRI2 Module

The components on the front panel of the TEPRI2 have the following functions:

Table 2.9 Front Panel of TEPRI2 Module

Port / LED	Function Description
P1	Port 1 for connecting T1/E1/PRI cables
P2	Port 2 for connecting T1/E1/PRI cables
LAN	Port for connecting to Ethernet
SIO	UART port (for testing)
TP1 LED	Indicates the type of program operated in Port 1 - On: PRI in operation - Off: T1/E1 in operation
TP2 LED	Indicates the type of program operated in Port 2 - On: PRI in operation - Off: T1/E1 in operation
L21 LED	Indicates the status of Layer 2 - On: Normal - Off: Abnormal
L22 LED	
AIS1 LED	Indicates the reception of the alarm bit of the remote system switch - On: Alarm bit received - Off : Alarm bit not received
AIS2 LED	
LOS1 LED	Indicates the signal loss (LOS) of the remote system switch - On: When signals are weak or have been damaged - Off: When signals are received properly
LOS2 LED	
SYN1 LED	Indicates the status of frame synchronization with the remote system switch - On: No frame synchronized - Off: Frame synchronized
SYN2 LED	
RUN LED	LED green: When E1 operates normally (blink cycle of 200 ms) LED orange: When T1 operates normally (blink cycle of 200 ms)
CLK LED	LED turns on when the reference clock is used as a system clock.

2.3.2.3 4BRI

The 4BRI module provides four ports for BRI-T/S connection. It transmits voice via the trunk line and a channel transmits voice data at 64 kbps.

Main Functions

The 4BRI module performs the following functions:

- Processes T or S signals by programming.
- Processes the following signals by programming: Point to Point Normal, Point to Point DDI, Point to MultiPoint.
- Switchable Resistor Terminations (100Ω)
- Endures the ITU-recommended level of surge.
- Protects the output port by monitoring line signals.
- Crystal-less wanders and jitter attenuation/compensation to TR62411.

- Attenuates/compensates jitter as recommended in ITU-T I.431 and G703.
- Performs local/remote loopback for test.

Specifications

The 4BRI module has eight line ports.

Front Panel

The front panel of the 4BRI voice module is shown below:

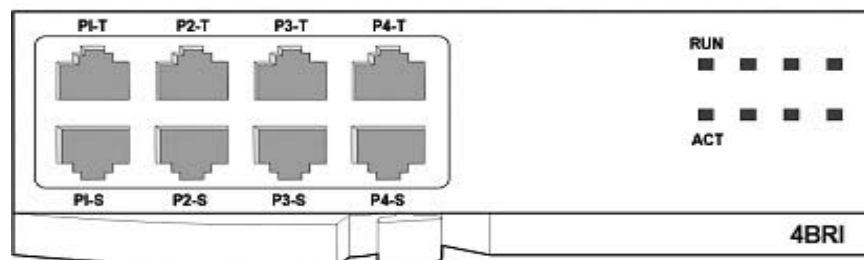


Figure 2.6 Front Panel of 4BRI Module

The components on the front panel of the 4BRI have the functions below:

Table 2.10 Front Panel of 4BRI Module

Port / LED	Function Description
P1-T to P4-T	BRI trunk ports
P1-S to P4-S	BRI station ports
RUN LED	On: Circuit is connected to this port.
ACT LED	On: Circuit is in use on this port.

2.3.2.4 8TRK

The 8TRK module provides eight ports of analogue trunk lines. One module has the PRS, MPD and CID paths. In addition, the module provides voice through trunk lines and transmits voice data at 64 kbps to each channel.

Main Functions

The 8TRK voice trunk line module performs the following functions:

- Detecting ring reception
- Detecting on/off-hook
- Transmitting dial pulse
- PRS
- MPD (optional)

- CID
- Line monitoring for checking if the line is connected periodically to transmit the voice data.
- Function that operates as the relay paths for caller information. (When caller information is entered as 8TRK, it is available to make a path that verifies the call information in the RCM2 option module by connecting the module to LP40.)

Specifications

The 8TRK voice trunk line module has eight trunk line ports.

Front View

The front panel of the 8TRK module is shown below:

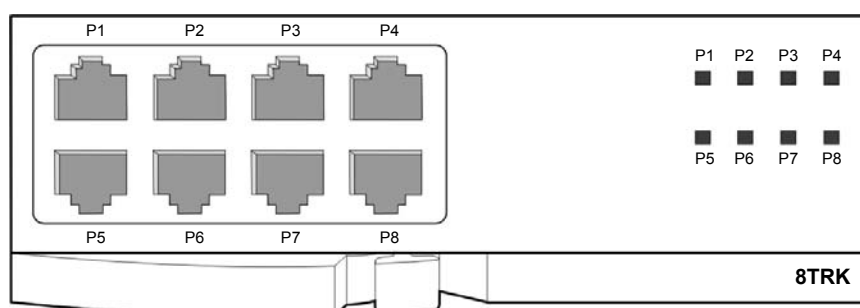


Figure 2.7 Front Panel of 8TRK Module

The components on the front panel of the 8TRK have the functions below:

Table 2.11 Front Panel of 8TRK Module

Port / LED	Function Description
P1~P8	Trunk Ports
P1~P8 LED	The status of ports - Off: Not used - On: In use - Blink: Receiving a ring

2.3.3 Voice Station Module

This section describes the module that offers the station voice service.

2.3.3.1 8DLI

The 8DLI (Digital Line Interface) module has eight ports for connecting digital phones to provide voice communication.

Specifications

The specifications of the 8DLI voice station modules are as follows:

- 8DLI Module: eight station ports and 2B+D (2 voice channel and 1 signal channel) provided

Front Panel

The front panel of the 8DLI voice station module is shown below:

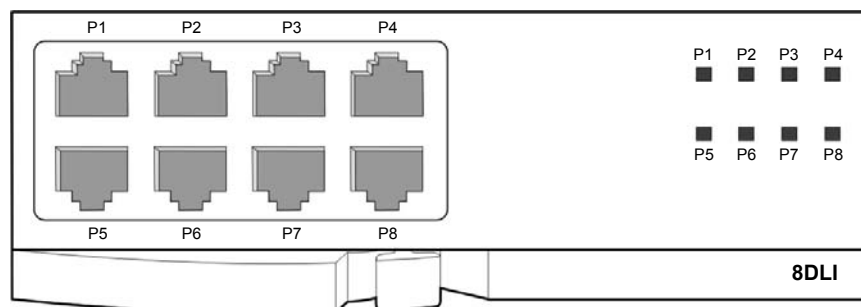


Figure 2.8 Front Panel of 8DLI Module

The components on the front panel of the 8DLI have the following functions:

Table 2.12 Front Panel of 8DLI Module

Port / LED	Function Description
P1~P8	Station ports for Samsung digital phones
P1~P8 LED	The status of the ports - Off: Not used - On: Station in use

2.3.3.2 8COMBO

The 8COMBO module has eight ports for analogue phones and eight ports for digital phones to provide voice communication.

Main Functions

The main functions of the 8COMBO voice station module are as follows:

- Generates ring at 20/25 Hz
- Detects DTMF/dial pulse
- Detects on-/off-hook
- Generates a tone

Specifications

The specifications of the 8COMBO voice station module are as follows:

- Eight analogue station ports
- Eight digital station ports

Front Panel

The front panel of the 8COMBO voice station module is shown below:

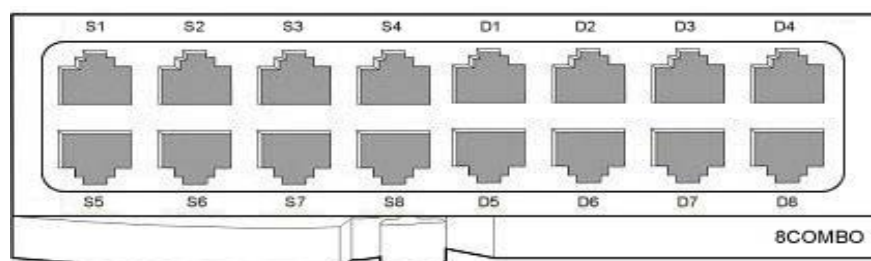


Figure 2.9 Front Panel of 8COMBO Module

The components on the front panel of the 8COMBO have the following functions:

Table 2.13 Front Panel of 8COMBO Module

Port / LED	Function Description
S1~S8	Analogue station ports
D1~D8	Digital station ports

2.3.3.3 16MWSLI

The 16MWSLI module has 16 ports for analogue phones to provide voice communication. It also provides a message waiting function.

Main Functions

The main functions of the 16MWSLI module are as follows:

- Generates ring at 20 Hz
- Detects Dial Tone Multi-Frequency(DTMF)/dial pulse
- Detects on-/off-hook
- Generates a tone
- Power Fail Transfer (PFT)
- Message Waiting
- Transmitting Polarity Reverse Signal (PRS)

Specifications

The 16MWSLI module provides 16 station ports.

Front Panel

The front panel of the 16MWSLI module is shown below:

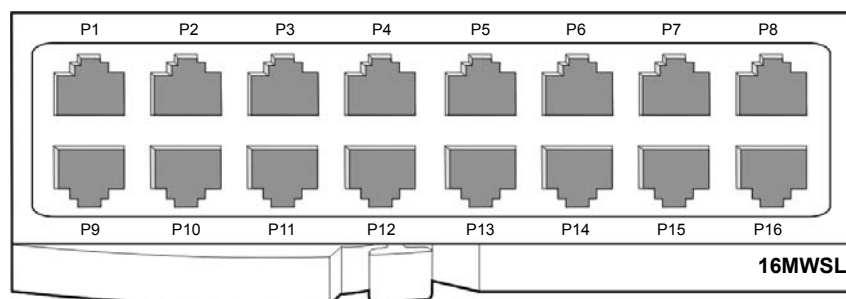


Figure 2.10 Front Panel of 16MWSLI Module

The components on the front panel of the 16MWSLI module have the following functions:

Table 2.14 Ports of 16MWSLI Module

Port / LED	Function Description
P1~P16	Station ports for analogue phones

2.3.3.4 16DLI2

The 16DLI2 module has 16 ports for digital phones to provide voice communication.

Specifications

The specifications of the 16DLI2 voice station module are as follows:

- 16 station ports
- 1B + D (1 voice channel and 1 signal channel)

Front Panel of 16DLI2

The front panel of the 16DLI2 module is shown below:

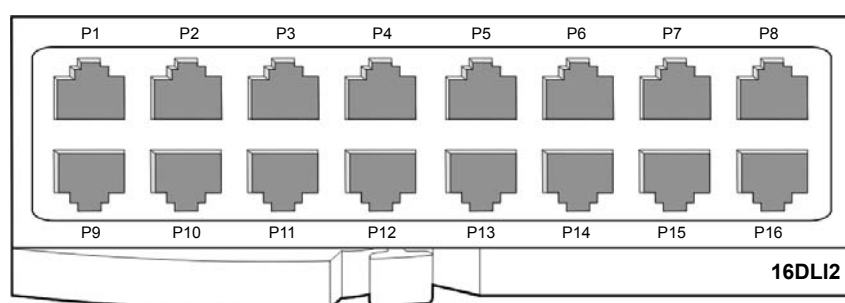


Figure 2.11 Front Panel of 16DLI2 Module

The components on the front panel of the 16DLI2 have the following functions:

Table 2.15 Front Panel of 16DLI2 Module

Port / LED	Function Description
P1~P16	Station ports for Samsung digital phones

2.3.4 Data Server Modules

This section describes the data modules for transmitting/receiving data to/from the Internet or Intranet.

2.3.4.1 LIM

The LAN Interface Module (LIM) transmits/receives data on the Intranet. It provides the 10/100 BASE-T interface and functions as a hub for switching.

Main Functions

The main functions of the LIM module are as follows:

- 10/100 BASE-T and full/half duplex auto-sensing
- VLAN for QoS
- Switching hub

Specifications

The LIM data module provides a 16-10/100 BASE-T port.

Front Panel

The front panel of the LIM data module is shown below:

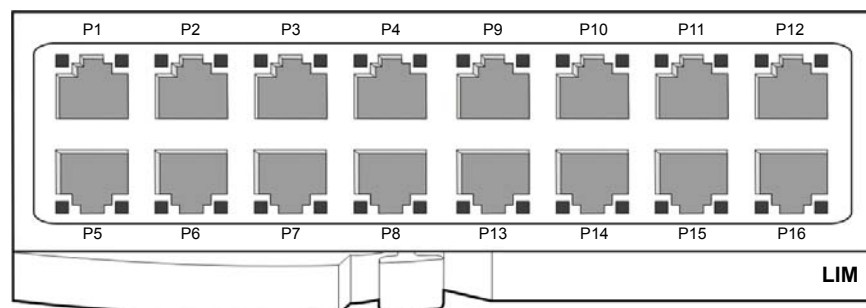


Figure 2.12 Front Panel of LIM Module

The components on the front panel of the LIM module have the following functions:

Table 2.16 Front Panel of LIM Module

Port / LED	Function Description
P1~P16	Ports for connecting to Ethernet
Left LED of each port	Link Operation - Blink: Link in operation
Right LED of each port	10/100 BASE-T Operation - Off: 10 BASE-T in operation - On: 100 BASE-TX in operation

2.3.4.2 PLIM

The PoE LAN Interface Module (PLIM) transmits and receives data to/from the Intranet and provides a 10/100 BASE-T interface. It also functions as Power over Ethernet (PoE) to provide 48V~54V power externally, and as a hub for switching.

Main Functions

The main functions of the PLIM data module are as follows:

- 10/100 BASE-T and Full/Half duplex auto-sensing
- VLAN for QoS
- Switching hub
- PoE



NOTE

Setting PLIM Module

PLIM can select the internal PSU (connecting shunt pins 1 and 2) or external rectifier (connecting shunt pins 2 and 3) using the shunt pins (J1, J2, J3). For details, see the *Samsung OfficeServ 7400 Installation Guide*.

Specifications

The PLIM data module provides 16 x 10/100 BASE-T ports.

Front Panel

The front panel of the PLIM data module is shown below:

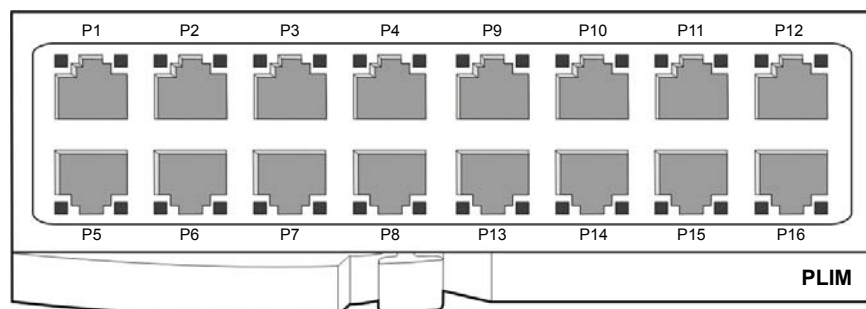


Figure 2.13 Front Panel of PLIM Module

The components on the front panel of the PLIM module are as follows:

Table 2.17 Front Panel of PLIM Module

Port / LED	Function Description
P1~P16	Ports for connecting to Ethernet
Left LED of each port	Link Operation - Blink: Link in operation
Right LED of each port	10/100 BASE-T Operation - Off: 10 BASE-T in operation - On: 100 BASE-TX in operation

2.3.4.3 GPLIM

The Gigabit PoE LAN Interface Module (GPLIM) transmits and receives data to/from the Intranet. It provides 12 x 10/100 BASE-T interface ports and 2 x 1000 BASE-TX/SX/LX ports. GPLIM functions as a hub for simple switching and provides the VLAN function for supporting QoS.

Main Functions

The main functions of the GPLIM data module are as follows:

- L2 Ethernet Switching
- 10/100 BASE Full/Half duplex auto-sensing
- VLAN Networking (802.1q)
- Packet Priority Control (802.1p)
- Flow Control (802.3x)
- Multicasting (IGMP Snooping)
- IEEE 802.3af Power over Ethernet (PoE)

Specifications

The specifications of the GPLIM data module are as follows:

- 12 x 10/100 BASE-T interface ports
- 2 x 1000 BASE-SX/LX/TX interface ports
- One Serial Console port (available to P12)

Front Panel

The front panel of the GPLIM data module is shown below:

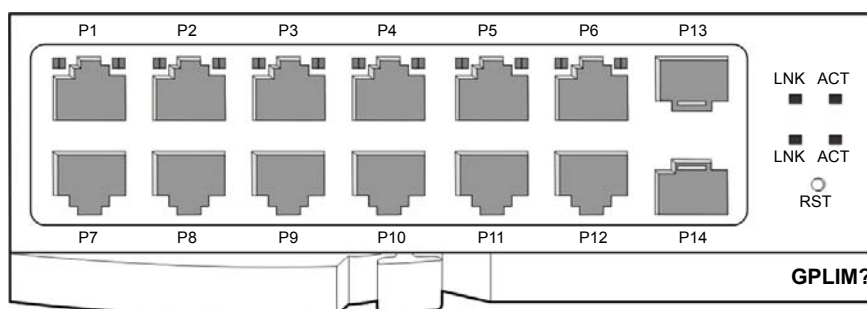


Figure 2.14 Front Panel of GPLIM Module

The components on the front panel of GPLIM function as follows:

Table 2.18 Front Panel of GPLIM Module

Ports, LED	Function Description
P1~P12	Ports for connecting to 10/100 BASE-T Ethernet
P13, P14	Ports for connecting to 1000 BASE-SX/LX/TX Gigabit Ethernet (GbE)
Left LEDs of P1~P6	<p>First LED: Operation of P1~P6</p> <ul style="list-style-type: none"> - On: LED turns green when a link is in operation - Blink: Active status <p>Second LED: 10/100 BASE-T operation of P1~P6</p> <ul style="list-style-type: none"> - Off: 10 BASE-T in operation - On: 100 BASE-TX in operation
Right LEDs of P1~P6	<p>First LED: Link operation of P7~P12</p> <ul style="list-style-type: none"> - On: LED turns green when a link is in operation - Blink: Each port blinks on active status <p>Second LED: 10/100 BASE-T operation of P7~P12</p> <ul style="list-style-type: none"> - Off: 10 BASE-T in operation - On: 100 BASE-TX in operation
LNK LEDs	LED turns on when P13~P14 Giga port connected
ACT LEDs	LED blinks when P13~P14 Giga port on active status
RST	Button for resetting GPLIM

2.3.4.4 GSIM

The Gigabit Switch Interface Module (GSIM) provides Gigabit LAN layer 2 and layer 3 interfaces to support the data network.

Main Functions

The main functions of the GSIM data module are as follows:

- L3 Unicasting Protocol
- L3 Multicasting Protocol
- Ethernet Switch (802.3 compatible)
- 1000 BASE-SX/LX/TX port
- Packet Priority Control (802.1p)
- VLAN Networking (802.1q)
- Diffserv
- Flow Control (802.3x)
- Multicasting (IGMPv1/v2, DVMRP, PIM-SM)

Specifications

The specifications of the GSIM data module are as follows:

- 1000 BASE-SX/LX/TX interface ports

Front Panel

The front panel of the GSIM data module is shown below:

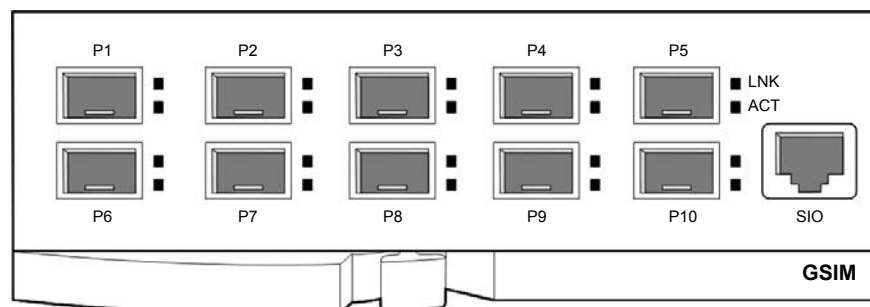


Figure 2.15 Front Panel of GSIM Module

The components on the front panel of the GSIM module function as follows:

Table 2.19 Front Panel of GSIM Module

Port / LED	Function Description
P1~P10	Port for connecting to 1000 BASE-SX/LX/TX GbE (Gigabit Ethernet)
SIO	Port for connecting RS-232
LNK LEDs	LED turns on when P1~P10 link connected
ACT LEDs	LED blinks when P1~P10 on active status

2.3.4.5 GWIM

The Gigabit WAN Interface Module (GWIM) provides WAN interfaces to support the data network to the keyphone system. GWIM provides a leased line for data communication between the keyphone system and the Internet, supports connection of an xDSL/cable modem interface, and performs functions for VPN, QoS and Firewall. For the leased line ports, there is a port for connection up to E1 speed, and a port for connection up to T3/E3 speed (50 Mbps). In addition, there is an additional DMZ port that makes firewall construction easy.

Main Functions

The main functions of the GWIM data module are as follows:

- Routing between WAN and LAN
- Supports Multiple WAN ports (Leased line, xDSL/cable modem interface)
- Functions for VPN, QoS and Firewall
- Provides various external interfaces for data transmission/reception with the external Internet.
- Provides ports for connecting with the internal network
- Leased line interface using V.35/HSSI
- 1000 BASE-FX Ethernet port working with xDSL or cable modem
- 1000 BASE-TX/SX/LX for Ethernet LAN interfaces
- UART ports for configuration setting
- Functions as various applications such as Firewall and VPN

Specifications

The specifications of the GWIM data module are as follows:

- 1000 BASE-SX/LX/TX ports
- One T1/E1 (V.35) port
- One T3/E3 (HSSI) port
- One serial console port

Front Panel

The front panel of the GWIM data module is shown below:

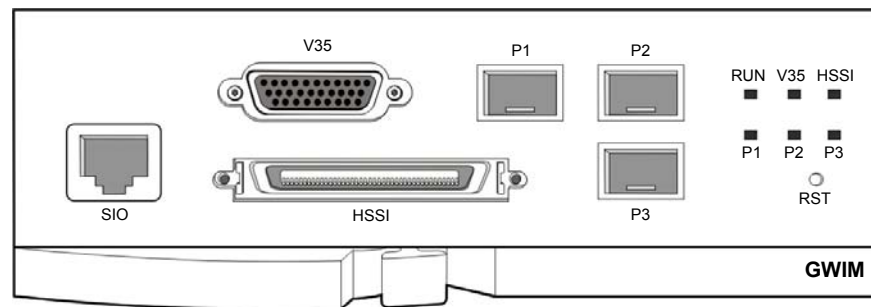


Figure 2.16 Front Panel of GWIM Module

The components on the front panel of the GWIM module are as follows:

Table 2.20 Front Panel of GWIM Module

Port / LED	Function Description
P1~P3	Ports for connecting to 1000 BASE-SX/LX/TX GbE (Gigabit Ethernet)
V35	Ports for connecting to T1/E1 links
HSSI	Ports for connecting to T3/E3 links
SIO	Ports for connecting RS-232
RUN LED	The status of the GWIM - Off: No power supplied or operation is abnormal - LED turns green: Normal status
V.35 LED	LED turns on when T1/E1 link is connected normally
HSSI LED	LED turns on when T3/E3 link is connected normally
P1 ~ P3 LED	LED turns on when the relevant link is connected normally
RST	Button for resetting the GWIM

2.3.4.6 4DSL

The 4DSL (Digital Subscriber Line) module uses VDSL technology to send/receive data to/from external IP devices on the Intranet. (Applied after V2.45.)

Specifications

- Quadrature Amplitude Modulation (QAM) for four VDSL ports
- Transmission distance: 1.0 km
- Up/Down Links
 - 0~300 m: Downstream 30 Mbps, Upstream 10 Mbps
 - 300 m ~ 1 km: Downstream 20 Mbps, Upstream 3 Mbps

Front Panel

The front panel of the 4DSL data module is shown below.

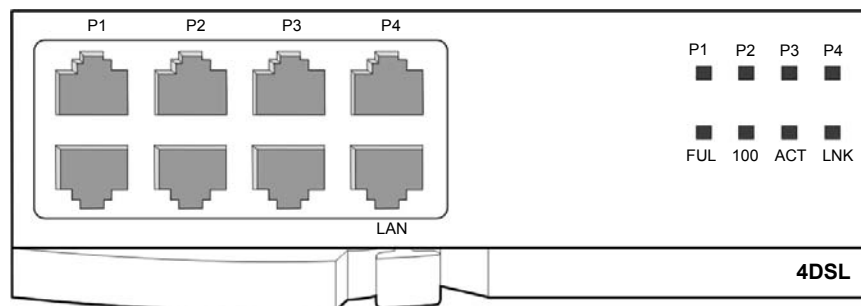


Figure 2.17 Front Panel of 4DSL Module

The components on the front panel of 4DSL are as follows:

Table 2.21 Front Panel of 4DSL Module

Port / LED	Function Description
P1~P4	Ports for connecting VDSL
LAN	10/100 BASE-T Ethernet Port for connecting to the upper Intranet
P1~P4 LED	Port status - Off: No Link connected - On: Link in operation - Blink: Data are being transmitted/received
FUL LED	Indicates Full/Half duplex operation (LED turns on at Full operation)
100 LED	Indicates the speed 10/100Mbps (LED turns on at the speed of 100)
ACT LED	LED blinks when data is transmitted or sent
LNK LED	Checks if a link is connected

2.3.5 Voice Application Module

This section describes the interface module using Digital Adaptor for Subscriber Loop (DASL) to send/receive voice to/from the phone system and wireless base station. It converts voice to data and sends/receives the data.

2.3.5.1 MGI

The Media Gateway Interface (MGI) module converts voice to data and sends/receives the data via the data network. The MGI offers up to 16 channels and decompresses voice using G.729, G.723, G.726, and G.711.

Main Functions

The main functions of the MGI voice application module are as follows:

- Voice decompression: G.729, G.723, G.726, G.711
- Facsimile relay: Provides two facsimile channels and four voice channels per module (two channels per module)
- Echo cancellation
- Volume adjustment (-30~+30 dBm)
- Silence suppression

MGI2D Optional Module

The MGI2D option module can be mounted on the MGI module to convert voice into packets. Up to four MGI2D modules can be mounted. An MGI2D module processes four channels, so the MGI module can process up to 16 channels of voice signals.

Front Panel

The front panel of the MGI voice application module is shown below:



Figure 2.18 Front Panel of MGI Module

The components on the front panel of the MGI module function as follows:

Table 2.22 Front Panel of MGI Module

Port / LED	Function Description
LAN	Ports for connecting Ethernet
SIO	UART port (for testing)
RST	Button for resetting MGI module
PWR LED	Power supply status - Off: Power supply blocked - On: Power supplied
RUN LED	MGI operation - Off: Power supply blocked - On: Booting - Blink: RAM program in operation
LAN TX LED	Ethernet Data Reception - Off: No data - On or Blink: Data received
LAN Rx LED	Links and Ethernet Data Reception - Off: No data or no link connected - On or blink: Data received
SVC LED	Service - LED blinks when the task service of the software is available
DSP LED	VoIP DSP operation - LED blinks when VoIP DSP is operational
RTPT LED	Voice packet transmission - LED turns on when transmitting voice packets
RTPR LED	Voice packet reception - LED turns on when receiving voice packets

2.3.5.2 MGI64

The MGI64 module transmits and receives voice via the data network after converting it into data. The MGI64 is provided with up to 64 channels and decompresses voice using G.729, G.723, G.726 and G.711. The MGI64 provides the VoIP functions to serve as both client and server.

Main Functions

The main functions of the MGI64 voice application module are as follows:

- Voice decompression: G.729, G.723, G.726, G.711
- Facsimile relay: One channel per 4 channels
- Echo cancellation
- Volume adjustment
- Silence suppression

Front Panel

The front panel of the MGI64 voice application module is shown below:

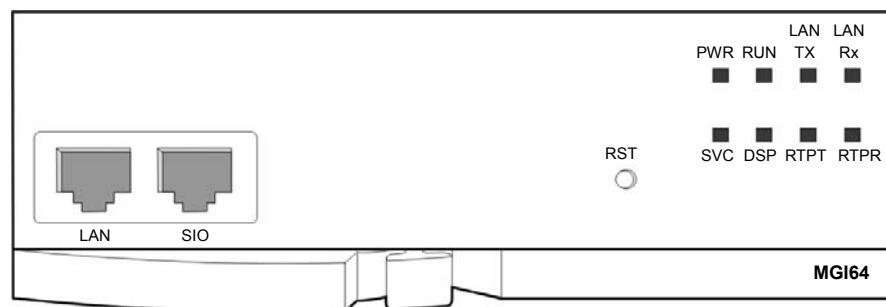


Figure 2.19 Front Panel of MGI64 Module

The components on the front panel of the MGI64 module function as follows:

Table 2.23 Front Panel of MGI64 Module

Port / LED	Function Description
LAN	Port for connecting to Ethernet
SIO	UART port (for testing)
RST	Button for resetting MGI module
PWR LED	Power supply - Off: Power supply blocked - On: Power supplied
RUN LED	MGI64 status - Off: Power supply blocked - On: Booting - Blink: RAM program in operation

Table 2.23 Front Panel of MGI64 Module (Continued)

Port / LED	Function Description
LAN TX LED	Ethernet Data Transmission - Off: No data - On or Blink: Data are being transmitted
LAN Rx LED	Links and Ethernet Data Reception - Off: No data or no link connected - On or blink: Data received
SVC LED	Service - LED blinks when the task service of the software is available
DSP LED	VoIP DSP operation - LED blinks when VoIP DSP is operational
RTPT LED	Voice packet transmission - LED turns on when transmitting voice packets
RTPR LED	Voice packet reception - LED turns on when receiving voice packets

2.3.5.3 4WLI

The 4WLI interface module uses DASL to send/receive voice to/from the phone system and wireless AP (WBS24 Combo). This module decompresses voice using G.726, and uses the 802.11b WLAN or DECT. The 4WLI supports four APs and one AP can accommodate four channels. The WLI integrates DECT with the WLAN using software conversion to work with wireless AP.

Main Functions

The main functions of the 4WLI voice application module are as follows:

- Voice decompression: G.711/G.729
- Wireless specification: 802.11b WLAN

Specifications

The specifications of the 4WLI module are as follows:

- Up to four APs
- Simultaneous calling through up to four channels per AP
- The maximum number of mobile station subscribers is 120

Front Panel

The front panel of the 4WLI module is shown below:

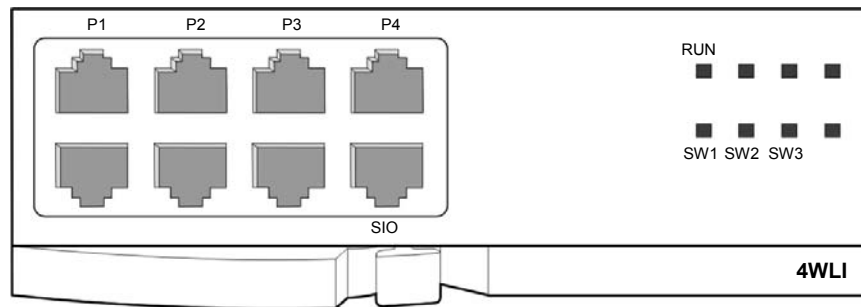


Figure 2.20 Front Panel of 4WLI Module

The components on the front panel of the 4WLI have the following functions:

Table 2.24 Front Panel of 4WLI Module

Port / LED	Function Description
P1~P4	Port for connecting to WBS24 Combo AP
SIO	UART port (for testing)
RUN LED	LED turns on if wireless LAN service is in operation
SW1~SW3 LED	LED turns on if the software task is in operation

2.3.6 SVMi-20E

Samsung integrated Voice Mail SVMi-20E is a Voice Mail System (VMS) with its own voice mailbox and auto attendant. SVMi-20E provides all voice mailbox functions required by subscribers and it is easy to install and use. For details, refer to your **SVMi-20E** documentation.

Main Functions

The main functions of the SVMi-20E module are as follows:

- Auto attendant and voice mailbox (separately or simultaneously)
- By default, four calls can be processed simultaneously. If upgraded, up to 12 calls can be processed simultaneously.
- Voice ports can be added easily if necessary (modular design).
- Only one SVMi-20E can be installed in the OfficeServ 7400 system. Other voice mail systems cannot connect to SVMi-20E.
- When a voice message (.wav) or fax message (.tiff) is left, E-Mail Gateway delivers that message to the subscriber's e-mail inbox.

Specifications

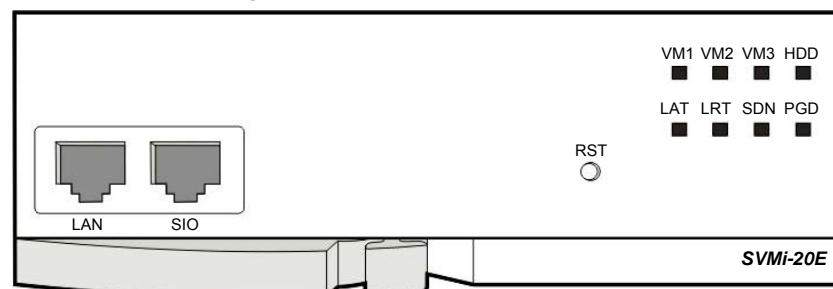
The specifications of SVMi-20E are as follows:

- Ports (default): 4
- Maximum ports (upgrade): 12
- Maximum storage time: 0-9999 days (Default: 9999)
- Maximum subscribers: unlimited (Default: 1000)
- Message Holding Period: 0-9999 days (Default: 9999)
- Total Messages per Mailbox: 0-9999 (Default: 9999)
- Total Message Holding Time: 0-9999 seconds (Default: 600)

Front Panel

The front panel of the SBC module, the main module of the SVMi-20E, is shown below:

Figure 2.21 Main Module of SVMi-20E



The components on the front panel of the main SVMi-20E module have the following functions:

Table 2.25 Main SVMi-20E Module

Category		Function Description
LAN		The LAN interface connector is used for data transmission and data-base backup and restoration. The SVMi-20E backs up or restores data using the LAN provided by the customer or through a laptop or PC connected directly to this LAN connector.
SIO		Serial Interface for connecting to PC.
RST		Button restarts the SVMi-20E (calls in process are disconnected).
LED	VM1	LED blinks when one or more of the default ports 1~4 are used
	VM2	LED blinks when one or more of the additional ports 5~8 are used
	VM3	LED blinks when one or more of the additional ports 9~12 are used
	HDD	LED blinks whenever contacting to hard disk driver.
	LAT	LED turns green when LAN port is operated.
	LRT	LED turns orange when transmitting data to LAN.
	SDN	Indicating the system status. LED turns red when the system driver is loaded and turns green when loading is terminated.
	PGD	LED turns green when the system power supply is normal.

2.4 Station Phones

This section describes the types and features of analogue/digital station phones that can be connected to the OfficeServ 7400 system.

2.4.1 Analogue Phones

Analogue phones are connected to ports of the 8COMBO/16MWSLI module.

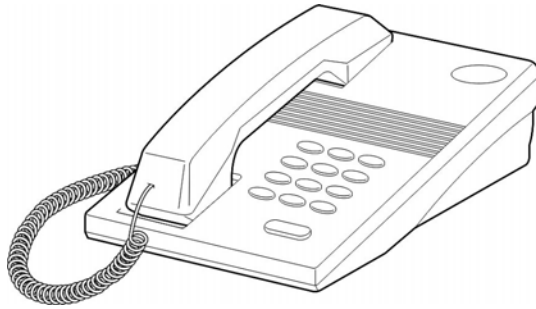


Figure 2.22 Typical Analogue Phone

2.4.2 Digital Phones

Digital phone are used for voice calls or data transmission and are connected to ports of the 8DLI/8COMBO/16DLI2 module. Devices such as Add-On Modules (AOM) and keyset daughterboards (KDB-D, and KDB-S) can be added to digital phones as enhancements.

5000 Series Digital Keysets

14-Button 2-Line LCD Keyset (DS-5014D)

- 48-character display (2x24) LCD with 3 associated soft keys and scroll key
- 14 programmable keys
- Navigation keys for easy use of keyset functions
- Five fixed-function keys
- Built-in speakerphone
- Keyset Status Indicator
- Eight selectable ring tones
- Volume Up/Down keys for digital control of speaker, handset and ringer volumes
- Desk- or wall-mounted



21-Button 2-Line LCD Keypad (DS-5021D)

- 48-character display (2x24) LCD with 3 associated soft keys and scroll key
- 21 programmable keys
- Navigation keys for easy use of keypad functions
- Five fixed-function keys
- Built-in speakerphone
- Keypad Status Indicator
- Eight selectable ring tones
- Volume Up/Down keys for digital control of speaker, handset and ringer volumes
- Desk- or wall-mounted



7-Button 2-Line LCD Keypad (DS-5007S)

- 48-character display (2x24) LCD with 3 associated soft keys and scroll key
- Seven programmable keys
- Five fixed-function keys
- Built-in speakerphone
- Keypad Status Indicator
- Eight selectable ring tones
- Volume Up/Down keys for digital control of speaker, handset and ringer volumes
- Desk- or wall-mounted



14-Button 2-Line LCD Keypad (DS-5014S)

- 48-character display (2x24) LCD with 3 associated soft keys and scroll key
- 14 programmable keys
- Five fixed-function keys
- Built-in speakerphone
- Keypad Status Indicator
- Eight selectable ring tones
- Volume Up/Down keys for digital control of speaker, handset and ringer volumes
- Desk or wall-mounted



38-Button 2-Line LCD Keypad (DS-5038S)

- 48-character display (2x24) LCD with 3 associated soft keys and scroll key
- 38 programmable keys
- Five fixed-function keys
- Built-in speakerphone
- Keypad Status Indicator
- Eight selectable ring tones
- Volume Up/Down keys for digital control of speaker, handset and ringer volumes
- Desk- or wall-mounted



12-Button Large LCD Keypad (DS-5012L & LE)

- Large LCD with 12 keys for feature selection
- Supports data transfer, handset calls and full-duplex speakerphone
- USB interface
- Navigation keys for easy use of keypad functions
- Five fixed-function keys
- Keypad Status Indicator
- Eight selectable ring tones
- Volume Up/Down keys for digital control of speaker, handset and ringer volumes



NOTE

Up to eight DS-5012L / LE phones can be connected to the DLI module (8DLI/16DLI2). Up to 77 DS-5012L / LE phones can be connected to both the basic chassis and expansion chassis (231 in total).

2.4.3 IP Phones

Internet (IP) phones use IP addresses to send/receive voice and data. They use existing data network lines so do not need normal phone lines, and can be connected to devices such as a switching hub. They are connected to other digital phones through the MGI module.

5000 Series IP Phones

12-Button Large LCD IP Keyset (ITP-5012L)

- Large LCD with 12 keys for feature selection
- Supports data and voice transfer using Internet Protocol
- Navigation keys for easy use of Keyset functions
- Five fixed-function keys
- Keyset Status Indicator
- Eight selectable ring tones
- Volume Up/Down keys for digital control of speaker, handset and ringer volumes



14-Button 2-Line LCD IP Keyset (ITP-5014D)

- 48-character display (2x24) LCD with 3 associated soft keys and scroll key
- Supports data and voice transfer using Internet Protocol
- 14 programmable keys
- Navigation keys for easy use of keyset functions
- Five fixed-function keys
- Built-in speakerphone
- Keyset Status Indicator
- Eight selectable ring tones
- Volume Up/Down keys for digital control of speaker, handset and ringer volumes
- Desk- or wall-mounted



21-Button 2-Line LCD IP Keyset (ITP-5021D)

- 48-character display (2x24) LCD with 3 associated soft keys and scroll key
- Supports data and voice transfer using Internet Protocol
- 21 programmable keys
- Navigation keys for easy use of keyset functions
- Five fixed-function keys
- Built-in speakerphone
- Keyset Status Indicator
- Eight selectable ring tones
- Volume Up/Down keys for digital control of speaker, handset and ringer volumes
- Desk- or wall-mounted



5100 Series IP Phones

12-Button Large LCD IP Keyset (ITP-5112L)

- Large colour LCD with 12 keys for feature selection
- Supports data and voice transfer using Internet Protocol
- Navigation keys for easy use of Keyset functions
- Five fixed-function keys
- Keyset Status Indicator
- Eight selectable ring tones
- Volume Up/Down keys for digital control of speaker, handset and ringer volumes



14-Button 2-Line LCD IP Keyset (ITP-5114D)

- 48-character display (2x24) LCD with 3 associated soft keys and scroll key
- Supports data and voice transfer using Internet Protocol
- 14 programmable keys
- Navigation keys for easy use of keyset functions
- Five fixed-function keys
- Built-in speakerphone
- Keyset Status Indicator
- Eight selectable ring tones
- Volume Up/Down keys for digital control of speaker, handset and ringer volumes
- Desk- or wall-mounted



21-Button 2-Line LCD IP Keyset (ITP-5121D)

- 48-character display (2x24) LCD with 3 associated soft keys and scroll key
- Supports data and voice transfer using Internet Protocol
- 21 programmable keys
- Navigation keys for easy use of keyset functions
- Five fixed-function keys
- Built-in speakerphone
- Keyset Status Indicator
- Eight selectable ring tones
- Volume Up/Down keys for digital control of speaker, handset and ringer volumes
- Desk- or wall-mounted



7-Button 2-Line LCD Keypad (DS-5107S)

- 48-character display (2x24) LCD with 3 associated soft keys and scroll key
- Supports data and voice transfer using Internet Protocol
- Seven programmable keys
- Five fixed-function keys
- Built-in speakerphone
- Keypad Status Indicator
- Eight selectable ring tones
- Volume Up/Down keys for digital control of speaker, handset and ringer volumes
- Desk- or wall-mounted



2.4.4 Add-On Module (AOM)

DS-5064B 64-Button AOM

- 64 programmable keys with red LEDs
- Up to four can be assigned to a keypad to provide additional programmable keys



2.4.5 Keypad Daughterboard (KDB)

5000 Series Keypad Daughterboard

DS-5014D, DS-5021D and DS-5038S keypads support one of three different types of daughterboard installed on them to enhance operation or to provide an additional local port, depending on the type of daughterboard.

KDB-Digital Line Interface (KDB-D)

If your keypad is connected to a Digital Line Interface (DLI) port that supports 2B+D operation, you may install a daughterboard that provides a Digital Line Interface (DLI) port for connection of a digital station device such as a keypad or 64 button add-on modules.



KDB-Single Line Interface (KDB-S)

If your keypad is connected to a Digital Line Interface (DLI) port that supports 2B+D operation, you may install a daughterboard that provides a Single Line Interface (SLI) port for connection of a standard telephone device such as a cordless phone.



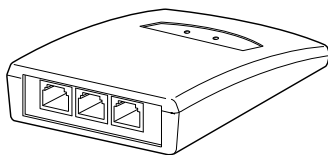
KDB-Full Duplex (KDB-F)

The standard speakerphone mode of operation for 2-line LCD keysets is 'half duplex'. This means that you cannot transmit and receive speech at the same time. Adding a KDB-F to your keyset will convert the speakerphone into full duplex mode, enhancing its operation. In addition, the KDB-F may have up to three external microphones attached to it for conference room type applications. These microphones require an 'EXTMIC' key programmed on the keyset to activate or deactivate them.

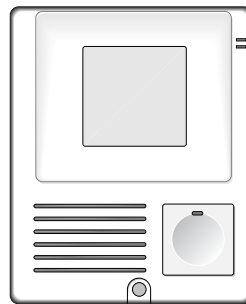


2.4.6 Door Phone and Door Phone Interface Module (DPIM)

The DPIM adapts any DLI circuit for use with the door phone unit. The unit is commonly used to request entry through locked doors (interior or exterior) or as a room monitoring box. It provides contact control to be used with a customer-provided electric door lock. The door phone is wall-mounted. An external weather-resistant unit is also available.



DPIM



Door Phone

2.5 Wireless LAN Device

This section describes the wireless LAN Access Point (AP) and mobile stations that can be connected with the OfficeServ 7400 system. Two types of AP are available: the WBS24 (Combo), connected via the 4WLI card, and the WBS24 (Basic), connected via the MGI card.

2.5.1 Wireless LAN Base Station (Combo and Basic)

The WBS24 consists of a wired processing component and wireless processing component. The wired processing component has an IEEE 802.3 Ethernet interface connected to the LAN. The wireless processing component has 2.4 GHz frequency bandwidth of wireless LAN, which complies with the RF interface based on the IEEE 802.11b standard.

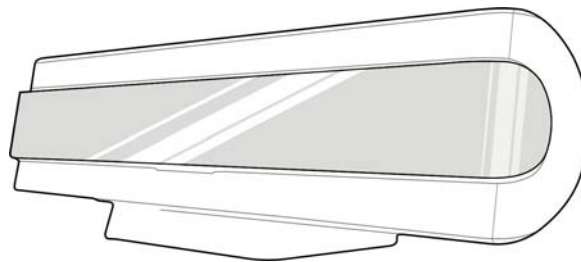


Figure 2.23 WBS24

The wired Ethernet interface is connected with the LAN based on 10/100 BASE-T and transmits/receives data (e.g., Internet access) other than voices. The wireless processing component transmits/receives voice data for wireless voice calls and accesses the wireless Internet. The maximum transmission speed on the wireless component is 3~4 Mbps. Several users can simultaneously access the wireless Internet using a WBS24.

2.5.2 Mobile Station

The mobile phone WIP-5000M (wireless IP-Phone mobile type) uses IEEE802.11b wireless LAN to allow users to make voice calls. The phone performs the wireless IP function by compressing voice (Voice over WLAN) and transmitting as data packets. It supports hand-over when moving between Access Points (WBS24). Data terminals such as PDAs and laptop PCs that support wireless connection can be used along with the WIP-5000M. The WIP-5000M also performs the message service functions supported by the OfficeServ 7400 system.



Figure 2.24 WIP-5000M Mobile Phone

2.6 Additional Devices

This section describes the types and features of optional devices that can be connected when the OfficeServ 7400 is installed.

2.6.1 On Hold/Background Sound Source

External sound sources (for example, cassette recorders, radios, CD players) can be connected to provide additional sources of sound to the basic tones provided by the system for background music, music on hold or announcements.

2.6.2 External Speakers

The OfficeServ 7400 can be connected with external units such as amplifiers or speakers in addition to the phones' internal speakers. The external units are connected via the MISC1 port of the MIS module, an optional module that can be mounted on the LP40 control module.

2.6.3 Loud Bell

The Loud Bell allows users to hear ring signals from outside lines using amplifiers or external speakers. The Loud Bell is connected via the MISC1 port of the MIS module, an optional module that can be mounted on the LP40 control module. When the secondary call device is connected, a call signal rings from the phone assigned as the ring pair in MMC 205 (Assign Loud Bell). Refer to the *OfficeServ 7400 Programming Guide* for details.

2.6.4 Common Bell

The Common Bell is a ring that can be specified when a station group is set. Once a station in a group rings, other stations in the group ring. The Common Bell is connected via the MISC1 port of the MIS module, an optional module that can be mounted on the LP40 control module.

2.6.5 OfficeServ Manager (OSM)

The OfficeServ Manager (OSM) is software for maintaining the OfficeServ 7400. The functions for controlling the system database are implemented in the form of menus in the OSM; thus, the OSM is convenient for checking and changing system data. Also, users can understand and use the system operational commands easily because the commands for maintenance are unified.

2.6.6 SMDR

The Station Message Detail Recording (SMDR) function manages the entire calling data, such as calls between station subscribers connected with the OfficeServ 7400, and local/long distance/international calls. Connect the SMDR printer or PC with the OfficeServ 7400 to use the SMDR data provided by the system.

- The SMDR printer can display the call history received from the OfficeServ 7400; however it cannot display data other than the call history (e.g. call cost data).
- The SMDR PC displays the call history received from the OfficeServ 7400 and calculates call costs using the SMDR software based on the call history. Accordingly, the SMDR PC allows users to manipulate data more efficiently than the SMDR printer.

2.6.7 CTI

Computer-Telephony Integration (CTI) is an integrated system that works with computers connected to PBXs so that the computers make use of the PBXs as computer resources and the PBXs can share computer resources. CTI provides the operator with convenience and reduced costs, and customers with enhanced services and reduced call processing time.

CTI call centre systems configure data on customers in databases. Based on the databases, the call centre can consult with customers on a one-to-one basis. CTI integrates communication, computers and databases to allow users to carry out marketing techniques such as customer-focused telemarketing.

The OfficeServ 7400 supports the standard Telephony Application Programming Interface (TAPI), which is implemented in a client/server environment and controls third party calls.

CHAPTER 3. OfficeServ 7400 Specifications

This chapter provides the following details on OfficeServ 7400: capacities, electrical specifications, power specifications, rings and tones, compatible modules and terminals, and equipment specifications.

3.1 System Capacity

Up to 1344 lines can be installed and operated in the OfficeServ 7400 system, and the ratio of station to trunk lines can be adjusted depending on users' needs. Table 3.1 below shows the maximum line capacity of the OfficeServ 7400.

Table 3.1 OfficeServ 7400 Capacity

System Configuration	Maximum Line Capacity
Basic chassis	When using E1: 600 When using 8TRK: 80 When using DLI/SLI: 160 When using the maximum capacity: 320 (voice) When using the LAN switch: 176 When using the internal power of PLIM: 32 When using VDSL: 20 When using the WLAN terminal or IP phone: 640 SVMi-20E: one per system (12 ports) MFM: 2 per system (2x12 ports) RCM2: Up to 2 per system (R2 = 8 ports or CID = 14) (R2 = 4/CID = 6 when both station and trunk lines are supported.) CRM: Up to 2 per system (MFM (20), R2 (16), or CID (16))

Table 3.1 OfficeServ 7400 Capacity (Continued)

System Configuration	Maximum Line Capacity
Basic chassis + Expansion chassis 1	When using E1: 930 When using 8TRK: 168 When using DLI/SLI: 336 When using the maximum capacity: 672 (voice) When using the LAN switch: 352 When using the internal power of PLIM: 64 When using VDSL: 40 When using the WLAN terminal or IP phone: 992 MFM: 4 per system RCM2: Up to 4 per system (R2 = 8 ports or CID = 14) (R2 = 4/CID = 6 when both station and trunk lines are supported.) CRM: Up to 4 per system (MFM (20), R2 (16), or CID (16))
Basic chassis + Expansion chassis 1 + Expansion chassis 2	When using E1: 1260 When using 8TRK: 256 When using DLI/SLI: 512 When using the maximum capacity: 1024 (voice) When using the LAN switch: 528 When using the internal power of PLIM: 96 When using VDSL: 60 When using the WLAN terminal or IP phone: 1344 MFM: 6 per system RCM2: Up to 6 per system (R2 = 8 ports or CID = 14) (R2 = 4/CID = 6 when both station and trunk lines are supported.) CRM: Up to 6 per system (MFM (20), R2 (16), or CID (16))

3.1.1 Trunk Line Capacity

The maximum trunk line capacity of the OfficeServ 7400 based on its configuration is shown in the table below:

Table 3.2 Trunk Line Capacity

System Configuration	Analogue	Digital		
	LOOP TRK	T1 TRK	E1 TRK	PRI TRK
Basic chassis	80	480	600	T1: 480 E1: 600
Basic chassis + Expansion chassis 1	168	744	930	T1: 744 E1: 930
Basic chassis + Expansion chassis 1 + Expansion chassis 2	256	1008	1260	T1: 1008 E1: 1260

3.1.2 Station (Subscriber) Line Capacity

The maximum station line capacity for analogue phones, digital phones and IP phones in the OfficeServ 7400, based on its configuration, is shown in Table 3.3.

Table 3.3 Station Line Capacity

	Maximum per Chassis		Maximum per System
	Basic	Expansion	
PLIM ports without 7150 * (ITP-5121D)	64	64	192
PLIM ports without 7150 (ITP-5112L)	53	53	159
GPLIM ports without 7150 (ITP-5121D)	64	64	192
GPLIM ports without 7150 (ITP-5112L)	53	53	159
DLI ports	160	176	512
SLI ports	160	176	512
DS-5012L / LE	77	77	231

(* External rectifier)

3.1.3 Number of Channels

The number of channels for each slot and the number of CID receivers and DTMF receivers are as follows:

Table 3.4 Channels for Each Slot

Category	Slot	Number of Channels
Basic chassis	1, 2, 4, 5, 6, 7, 8, 9, 10, 11	64
Expansion chassis	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	32
CID receiver	Based on basic chassis	14
DTMF receiver	Based on basic chassis	48

3.2 Electrical Specifications

3.2.1 Signal Specifications

The signal processing protocol refers to the method of sending signals between the trunk lines, stations and system, and how status information is provided.

3.2.1.1 Trunk Line Signalling Type

Loop Start

In processing loop start signals, the on-hook and off-hook statuses are controlled by the flow of electric current. The loop is a closed loop trunk circuit or a standard 2500-type set loop.

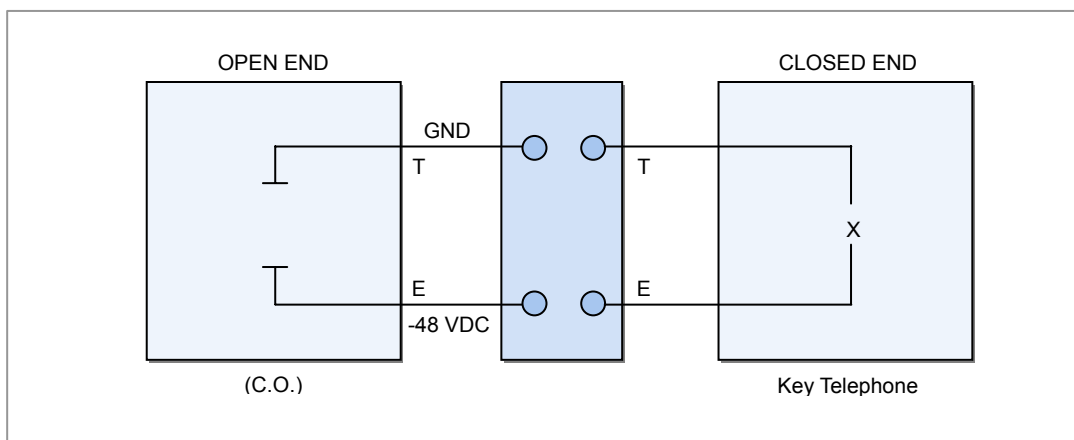


Figure 3.1 Trunk Line Loop Start Signalling

T1 Trunk Line

- The electrical characteristics of the T1 trunk line comply with the ITU G.703 and G.704 standards.

Table 3.5 Electrical Characteristics of the T1 Trunk Line

Categories		Specifications
Transmission speed		1544 kbit/s ± 50 ppm
Code		AMI or B8ZS
Pulse type		Regular square wave: When indicating all valid signals, comply with the mask (G.703) regardless of the codes.
Transmission media		A pair of twisted lines
Load resistance		100 Ω
Indicated (pulse) nominal peak voltage		3.00 V
Signal Level	Power at the frequency of 772 kHz	$\pm 12 \sim \pm 19$ dBm
	Power at the frequency of 1544 kHz	25 dB or higher when the power is less than the power at the frequency of 772 kHz

- The signalling specifications and the signalling method of the T1 trunk line should comply with the ITU G.703 and G.704 standards.

E1 Trunk Line

- The electrical characteristics of the E1 trunk line comply with the ITU G.703 and the G.704 standards.

Table 3.6 Electrical Characteristics of the E1 Trunk Line

Categories	Specifications
Transmission speed	2048 kbit/s \pm 50 ppm
Code	High Density Bipolar of Order 3 (HDB3)
Pulse type	Regular square wave: When indicating all valid signals, comply with the mask (G.703) regardless of the codes.
Nominal and pulse	244 ns
Jitter of the I/O terminal	Refer to the G.823
Transmission media	A pair of twisted lines
Load resistance	120 Ω
Indicated (pulse) nominal peak voltage	3.00 V
Blank (non-pulse) peak voltage	0 \pm 0.300 V

- The signalling specifications and the signalling method of the E1 trunk line comply with the ITU G.703 and G.704 standards.

Characteristics of the ISDN Interface Transmission

The electrical characteristics of the ISDN (BRI) interface comply with the ITU I.430 and ETS 300 012 standards.

Table 3.7 Electrical Characteristics of the BRI Trunk Line

Categories	Specifications
Transmission speed	192 kbit/s \pm 100 ppm
Code	AMI
Pulse type	Regular square wave: When indicating all valid signals, comply with the mask (I.403) regardless of the codes.
Transmission media	Pair of twisted lines
Load resistance	120 Ω
Indicated (pulse) nominal peak voltage	2.75 V

- The electrical characteristics of the ISDN (PRI) interface comply with the ITU I.431 and ETS 300 011 standards

Table 3.8 Electrical Characteristics of the PRI Trunk Line

Categories	Specifications
Transmission speed	2048 kbit/s \pm 50 ppm
Code	High Density Bipolar of Order 3 (HDB3)
Pulse type	Regular square wave: When indicating all valid signals, comply with the mask (I.403) regardless of the codes.
Nominal and pulse	244 ns
Transmission media	A pair of twisted lines
Load resistance	120 Ω
Indicated (pulse) nominal peak voltage	3.00 V
Blank (non-pulse) peak voltage	0 \pm 0.300 V

- The electrical characteristics of the Digital Line Interface (DLI) are shown in the table below:

Table 3.9 Electrical Characteristics of the DLI Line

Categories	Specifications
Transmission speed	38144 kbit/s
Code	AMI (Alternate Mark Inversion)
Pulse type	Typical AMI Waveform

3.2.1.2. Signalling Type of the Dedicated Line

Electrical Characteristics of the GWIM Interface

- The electrical characteristics of the V.35 interface are shown in the table below:

Table 3.10 Electrical Characteristics of the GWIM Interface (V.35 Interface)

Categories	Specifications
Maximum transmission speed	10 Mbit/s
Transmission code	V.35 driver
Number of transmission lines	18 EA
Characteristic resistance	100 Ω
Indicated (pulse) nominal peak voltage	\pm 2 V
Input Differential Threshold	\pm 80 mV

- The electrical characteristics of the RS-232C (V.28) interface are shown in the table below:

Table 3.11 Electrical Characteristics of the GWIM Interface (RS-232C Interface)

Categories	Specifications
Maximum transmission speed	230 kbit/s
Transmission code	V.28 driver
Number of transmission lines	14 EA
Indicated (pulse) nominal peak voltage	±15 V
Input Threshold	+1.2, -1.7 V

- The electrical characteristics of the HSSI interface are shown in the table below:

Table 3.12 Electrical Characteristics of the GWIM Interface (HSSI Interface)

Categories	Specifications
Maximum transmission speed	50 Mbit/s
Transmission code	HSSI driver
Number of transmission lines	50
Characteristic resistance	110 Ω
Indicated (pulse) nominal peak voltage	±1 V
Input Threshold	±0.15 V

3.2.1.3. Signalling Type of the LAN

- The electrical characteristics of the 10 Base-T interface, which comply with the IEEE802.3 standards, are shown in the table below:

Table 3.13 Electrical Characteristics of the LAN Interface (10 Base-T)

Categories	Specifications
Transmission speed	10 Mbps
Transmission code	Manchester coding. When the transmission data bit is '0', the higher level of the middle bit is inversed into the lower level. When the transmission data bit is '1', the lower level of the middle bit is inversed into the higher level.
Access control method	Carrier Sense Multiple Access/Collision Detect (CSMA/CD)
Transmission media	UTP (Unshielded Twisted Pair) CAT3, CAT4, CAT5, STP (Shielded Twisted Pair)
Number of UTP pairs	2 pairs
Characteristic resistance	100 Ω
Cable thickness	Diameter: 0.51 mm (24 AWG), External diameter: 5 mm

- The electrical characteristics of the 100 Base-Tx, which comply with the IEEE802.3u standards, are shown in the table below:

Table 3.14 Electrical Characteristics of the LAN Interface (100 Base-Tx)

Categories	Specifications
Transmission speed	100 Mbps
Transmission code	4B/5B+MLT-3 - 4bit/5bit converts the 4-bit data into 5-bit data and encodes the data on the physical layer. Multi Level Transmission-3 (MLT-3) encodes transmission data into 3 levels (high, middle, and low).
Access control type	CSMA/CD
Transmission media	UTP CAT5, STP
Number of UTP pairs	2 pairs
Characteristic resistance	100 Ω
Cable thickness	Diameter: 0.51 mm (24 AWG), External diameter: 6 mm

- The electrical characteristics of the 1000 BASE-TX interface, which comply with the IEEE802.3ab standards, are shown in the table below:

Table 3.15 Electrical Characteristics of LAN Interface (1000 BASE-TX)

Categories	Specifications
Transmission speed	1000 Mbps
Transmission code	8B1Q4 The 8-bit transmission data are converted into 9-bit transmission data via the additional treatment of scramble, error detection bit, and then are mapped into the transmission signals of 4 teams with 5 levels, and are randomized into each pair of transmission signals to be transmitted.
Access control method	CSMA/CD
Transmission media	UTP CAT5 (Maximum transmission distance 100 m)
Number of UTP pairs	4 pairs
Characteristic resistance	100 Ω
Cable thickness	Diameter 0.51 mm (24 AWG), External diameter 6 mm

- The electrical characteristics of the 1000 BASE-SX/LX interface, which comply with the IEEE802.3z standards, are shown in the table below:

Table 3.16 Electrical Characteristics of LAN Interface (1000 BASE-FX)

Categories	Specifications
Transmission speed	1000 Mps
Transmission code	8B/10B Data Encoding The 8-bit (8B) data entered from the upper layer of the MAC Part are handled in one nibble to be converted into 10-bit (10B) signals at the physical layer. Then each nibble of the converted data is transmitted. The transmission speed after the conversion into 8B/10B is 1250 Mbps.
Access control method	CSMA/CD
Transmission media	SX: Multimode Optical Fibre (MMF) LX: Multimode Optical Fibre/Single mode Optical Fibre (SMF)
Number of Optical Fibres	2 pairs
Maximum transmission distance	SX: Maximum 550 m LX: Maximum 5 km
Cable thickness	Diameter 0.51 mm (24 AWG), External diameter 6 mm

Table 3.17 1000 BASE-SX/LX Optical Fibre

Fibre Type	Mode Band (Short Wave/Long Wave MHz.Km)	Transmission Distance (m)	
		1000BASE-SX	1000BASE-LX
62.5uM MMF	160/500	220	550
	200/500	275	550
50uM MMF	400/400	500	550
	500/500	550	550



NOTE

Mode Band

The mode band shown in the above table is a quality indicator of the multimode optical fibre related to the transmission speed. Its unit is generally MHz.Km, and is proportional to the value of the bit rate of the optical signal (the on-off speed) multiplied by the maximum transmission distance. The size of this value means the high optical signal with high bit rate can be transmitted. Each mode band is standardized also in the use of short wave and long wave laser.



NOTE

Categories of UTP Cable

UTP Cables are classified into Straight-through UTP cable and Crossover UTP cable. Straight-through UTP cable is used for connecting the LIM module to other modules (MP40, MGI, 4DSL). Crossover UTP cable is used for connecting only the LIM (or PLIM) module to another LIM (or PLIM) module.

3.2.1.4 Station Signalling Type

Dial Pulse Signalling Type

- Ratio - 10 Pulses Per Second (PPS)
- Make/Break Ratio (M/B ratio) - 33% : 66% (can be adjusted in the software)
- The minimum signalling time between digits - 20 msec (can be adjusted in the software)

DTMF Push Button Dialling

DTMF signal processing complies with the ITU standard, allowing digital phone signals to be sent/received through the trunk line, and processing of analogue phone signals.

3.2.1.5 VDSL Signalling Type

The electrical characteristics of the VDSL for using long-distance Ethernet are shown in the table below:

Table 3.18 Electrical Characteristics of the VDSL Interface

Categories	Specifications
Transmission speed	1 M~16 Mbps
Modulation code	QAM (Quadrature Amplitude Modulation)
Error detection	Reed Solomon coding method
Transmission distance	1.0 km
Transmission media	1 pair of twisted lines
Characteristic resistance	Splitter installed
Used frequency	138 kHz~12 MHz
Link speed	Down link: 30 Mbps (300 m), Up link: 10 Mbps (300 m)

3.2.2 Transmission Characteristics

- Attenuation
 - Attenuation between subscribers: Less than 6 dB
 - Attenuation between the subscriber and local trunk line: Less than 0.5 dB
- Characteristic resistance of the line: 600 Ω
- Weighted noise: Less than -65 dBm
- Crosstalk attenuation: Less than -68 dBm
- Frequency band: 300~3400 Hz
- Insulation resistance: More than 1 M Ω

3.2.3 Line Conditions

- Length for installation:
 - Analogue phones: Up to 1 km (when AWG #24 cable is used)
 - Digital phones: Up to 400 m (when AWG #24 cable is used)
 - Door phones: Up to 400 m (when AWG #24 cable is used)
 - AOMs: Up to 400 m (when AWG #24 cable is used)
 - Length between 4WLI and Combo Access Point: Up to 600 m (when AWG #24 cable is used)
- Leakage resistance between lines: More than 20 k Ω
- Leakage resistance between grounds: More than 20 k Ω

3.3 Power Specifications

3.3.1 OfficeServ 7400 System Power

OfficeServ 7400 operates by AC input power or battery power. The system chassis is supplied with backup power of -54 V, -5 V, +5 V, +3.3 V, +12 V, or -56 V.

Table 3.19 I/O Voltage of PSU

Power Supply Devices		Specifications
Power Supply Unit (PSU)	Input power	AC 220 V
	Input power	- DC -54 V, 6.6 A - DC +5 V, 16 A - DC -5.3 V, 2 A - DC +3.3 V, 30 A - DC +12 V, 1 A - DC -56 V, 0.4 A (for backup)
External rectifier (Model name: OfficeServ 7150)	Input power	AC 220 V (for local use)
	Output Power	DC -54 V, 10 A

3.3.2 External Rectifier

The External Rectifier is used to supply power to IP phones or to WBS24 when PLIM is used in OfficeServ 7400 system.

The additional -54 V power is to be supplied as shown in Figure 3.2, to supplement insufficient internal power.

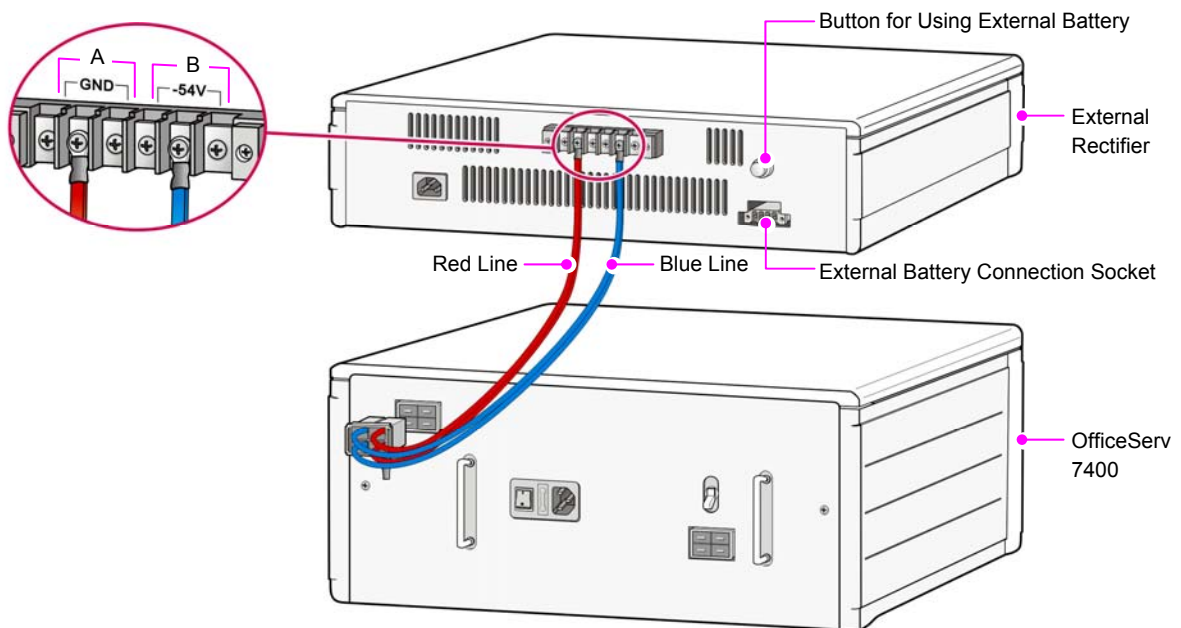


Figure 3.2 External Rectifier



NOTE

External Rectifier Installation

Refer to the *Samsung OfficeServ 7400 Installation Guide* for external rectifier installation instructions.

3.4 Rings and Tones

3.4.1 Ring Cycles

The OfficeServ 7400 provides trunk line rings, station rings, door rings, and alarm rings. The ON/OFF cycle of each ring is shown in the table below:

Table 3.20 System Ring Cycles

Ring	ON/OFF Cycles
Trunk line	400/200/400/3000 ms
Station	1000/2000 ms
Door	400/200/400/200/400/2000 ms
Alarm	400/200/400/200/400/200/400/1000 ms



Ring ON/OFF Cycle

The ON/OFF cycle can be adjusted by changing the values in the system database

3.4.2 Tones

The output voltage and the frequency of the ring signals in the OfficeServ 7400 are as follows:

- Output voltage: 75 V
- Frequency: 20 Hz

The OfficeServ 7400 provides various tones to notify users of the status of functional operations, and generally provide feedback to users. The ON/OFF cycles of currently specified tones are shown in the table below:

Table 3.21 System Tones Cycles

Tones	ON/OFF Cycles
Dial tone	1000/250 ms
Busy Tone	500/500 ms
Do Not Disturb tone	250/250 ms
Ring Back tone	1000/2000 ms
Call Park tone	Continuous
Confirmation/Caution/Barge-In tone	50/50 ms
Call Back/Hold tone	500/3500 ms
Error/Number Unobtainable tone	250/250 ms
Message Camp On tone	Continuous

3.5 Available Terminals

The terminals available to the OfficeServ 7400 are shown in the table below:

Table 3.22 OfficeServ 7400 Compatible Terminals

Types	Terminals
5000 Series digital phones	DS-5007S, DS-5014S, DS-5014D, DS-5021D, DS-5038S, DS-5012L/LE
5000 Series IP phones	ITP-5014D, ITP-5021D, ITP-5012L
5100 Series IP phones	ITP-5112L, ITP-5114D, ITP-5121D, ITP-5107S
Wireless LAN devices (WLAN)	WIP-5000M (Mobile terminals), WBS24 (Access Point Device)
AOM	DS-5064B AOM
Others	KDB-S, KDB-D, KDB-F, DPIM, door phone,



NOTE

Compatible Terminals

All other terminals compatible with the Samsung OfficeServ range of systems are available to the OfficeServ 7400.

3.6 Equipment Specification

The OfficeServ 7400 comprises one basic chassis to which one or two expansion chassis may be added as shown in the figure below:

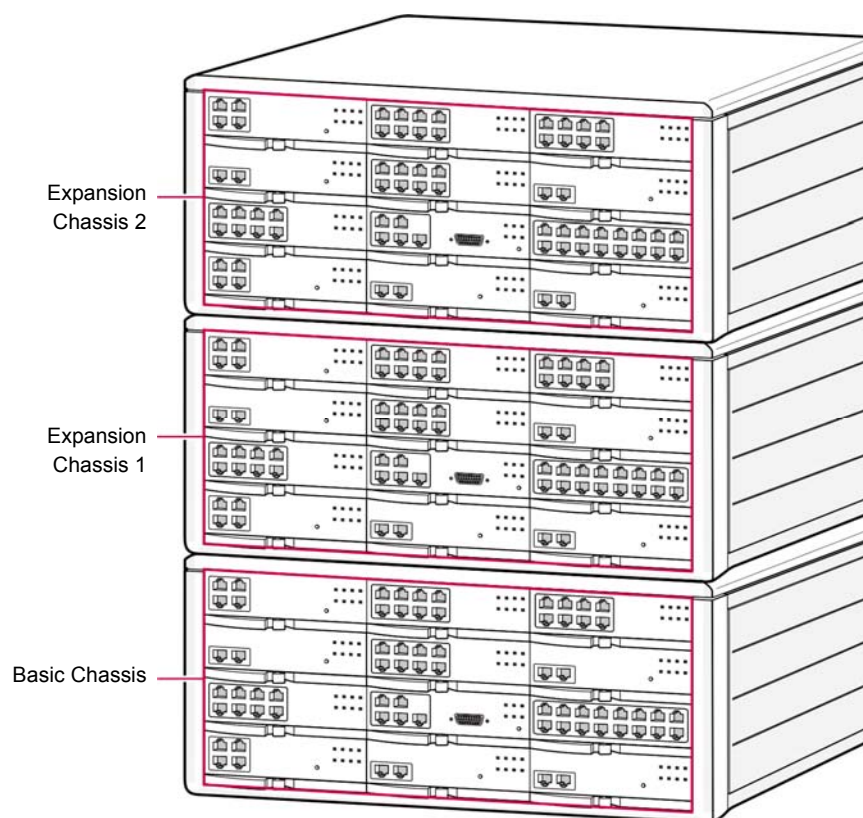


Figure 3.3 OfficeServ 7400 Chassis Configuration

- Basic chassis only:
 $440(\text{W}) \times 223.8(\text{H}) \times 410(\text{D}) \text{ mm}$
- Two chassis (basic + expansion chassis)
 $440(\text{W}) \times 447.6(\text{H}) \times 410(\text{D}) \text{ mm}$
- Three chassis (basic + two expansion chassis)
 $440(\text{W}) \times 671.4(\text{H}) \times 410(\text{D}) \text{ mm}$

CHAPTER 4. OfficeServ 7400 Functions

This chapter describes the functions of the OfficeServ 7400 relating to calls, VoIP, data, UMS, and web/system management

4.1 Call Functions

The OfficeServ 7400 processes station calls, trunk line calls, application calls, and various signals through the PSTN and VoIP networking.

4.1.1 Dynamic IP Address Allocation

DHCP Client of the MP40

To operate, the MP40 uses the DHCP client function to get the IP address allocated by the data server. In this case, the data server recognizes the MP40 of the call server from the host ID of the required DHCP information and allocates the IP address specified in the DHCP allocation table.

The MP40 can be operated using a fixed IP address, rather than using the dynamic DHCP allocation method.

MGI/MGI64 Configuration

The MGI can be operated by receiving the dynamically allocated IP address from the data server rather than by manually setting the IP address.

IP Phone Configuration

The IP phones registered to the OfficeServ 7400 can be operated by receiving the dynamically allocated IP address from the data server, rather than by manually setting the IP address.

4.1.2 VoIP UMS Interface

Auto Attendant/Mail Box Interface

The OfficeServ 7400 uses SIP and RPT, the VoIP protocols, to provide the auto attendant and mailbox functions through the UMS and IP network operating in the feature server. To interface with the VoIP UMS, the MGI module should be installed in the system.

E-mail Notice

The system periodically checks whether any e-mails are received in the e-mail account registered to the UMS and notifies the result to the user by voice or through the LCD screen or LED of the phone. To be notified by voice, the user needs to set the TTS (Text-To-Speech) function.

4.1.3 Router ALG Interface

NAT Application Level Gateway (ALG)

When functions, such as VoIP signal processing and the gateway function, executed through the IP network in the system, are executed in the Network Address Translation (NAT) network, the conversion between the private IP address and public IP address should be performed. In this case, the call server and the data server interface with each other and share the information on the conversion between the private IP and public IP. This enables the OfficeServ 7400 to provide services smoothly. This function operates only between the call server and data server.

Firewall ALG

When functions, such as VoIP signal processing and the gateway function, executed through the IP network in the system, are executed in the network that has a firewall, the system should be set to prohibit the firewall from cutting off the packet automatically (not manually) for smooth firewall traversing. This function operates only between the call server and data server.

VPN ALG

When functions, such as VoIP signal processing and the gateway function, executed through the IP network in the system, are executed in the Virtual Private Network (VPN), the system should be set to prevent packet blocking during IP address conversion due to tunnelling. In this case, the call server and data server interface with each other and share the tunnelling conversion information for smooth services. This function operates only between the call server and data server.

4.2 Data Server Functions

The OfficeServ 7400 provides functions for routing, switching, security, and provides data network applications and data access interfaces (WAN, LAN, DMZ).

4.2.1 Switches

802.1w Rapid Spanning Tree

Rapid Spanning Tree Protocol (RSTP) provides rapid convergence of the spanning tree and provides for fast reconfiguration, critical for networks carrying delay-sensitive traffic such as voice and video. The specification for RSTP is IEEE 802.1w-2001. The RSTP specification provides compatibility with legacy STP-based networks.

802.1p Packet Priority

The switch extracts the priority field from the Ethernet frame configured according to the 802.1p specification standard, and discriminatively processes the frame according to the priority of the specified operation standard.

The packets are categorized into emergent packets and non-emergent packets and are processed.

VLAN (802.1Q)

The Virtual Local Area Network (VLAN) groups related equipment by work group according to the LAN operational policy, regardless of the location of the equipment. The VLAN also processes switching for work groups. The VLAN removes the effects of unnecessary broadcasting packets and configures the stable switching subnet only for the corresponding group by separating and processing the group in the virtual LAN.

Accordingly, the switch can provide the differentiated QoS services and the VLAN can be configured based on the switch port and MAC address.

The system automatically configures the VLAN for IP phones, signal processing gateway, media gateway, and UMS required for OfficeServ 7400 services, and performs the QoS process. OfficeServ 7400 provides 32 VLAN groups.

IGMP Snooping

The L2 switch (located in the lower layer of the IP router) can process IGMP (Internet Group Management Protocol) messages to allow Multicasting to be used. This is referred to as IGMP Snooping.

The IP layer multicast group information included in the IGMP message is reflected in the MAC filtering database, its own switching database. The group information is processed in the MAC multicast address format mapped with the IP multicast address.

802.1x Supported

IEEE 802.1x standards define the formats and the operational procedures of EAP over LAN (EAPoL) frame that can send/receive the Extensible Authentication Protocol (EAP) between terminals and the Access Point (AP). These standards are called the port security protocol because they can be used in the procedure permitting network access by the terminal only by acquiring the physical port license of the Bridge or wireless AP from the authentication server. This authentication procedure by ports enables control of charging policies, usage restriction, band allocation, etc, separately.

Port Trunking Function Supported

Port Trunking means Port Aggregation, the collection of physical ports into logical ones. That is, like the 100 BASE-TX securing 100Mbps bandwidth, the function collects several ports into a logical port for expanding the bandwidth to be used.

PoE (IEEE 802.3af) Function Supported

Power over Ethernet (PoE) is designed so that no additional power supply to network equipment used in wireless or wired LAN is necessary. PoE allows the user to send the data and the power simultaneously via an Ethernet cable, thus reducing the installation cost in most cases and providing high flexibility in selecting the installation site for the equipment.

QoS Function Supported

OfficeServ 7400 provides the 802.1p Packet Priority and Level Classification Setup for supporting Quality of Service (QoS). The 802.1p Packet Priority is the expansion of the standard MAC header in the network packet. This expansion provides the packets with priority: a packet of higher priority is treated preferentially and is processed ahead of a packet of lower priority. The Level Classification Setup function gives the packets High/Low levels and processes them according to these levels, thus making the differential services possible.

GARP/GVRP Function Supported

Generic Attribute Registration Protocol (GARP)/Generic VLAN Registration Protocol (GVRP) define a GARP application that provides the 802.1Q-compliant VLAN pruning and dynamic VLAN creation on 802.1Q trunk ports. GVRP is an application defined in the IEEE 802.1P standard that allows for the control of 802.1Q VLANs.

4.2.2 Routers

Various Network Interface

OfficeServ 7400 provides the E0, E1, and E2 network interfaces (which are connected to the WAN through the Ethernet interface), and the serial network connected through the V.35, HSSI serial interface.

Static Routing

The OfficeServ 7400 configures a fixed routing table between each network interface to process the static routing. In this case, the routing table cannot be dynamically changed by the routing protocol, and specific routing services will be provided according to the pre-set routing policy.

WAN Interface (Ethernet, PPPoE, DHCP Client)

E0, E1, E2 Ethernet WAN Interface enables connection to the Internet using the Static IP, PPPoE, and DHCP client protocol.

V.35 Interface (PPP, HDLC, Frame Relay)

The OfficeServ 7400 accesses the Internet through the V.35 serial interface with a transfer speed of up to 2Mbps. In this case, the OfficeServ 7400 supports various environments using functions such as PPP, HDLC, and Frame Relay Encapsulation.

HSSI Interface (PPP, HDLC, Frame Relay)

The Internet can be connected via the High Speed Serial Interface (HSSI) with a maximum transmission speed of 52Mbps. Generally, HSSI can use the equipment on a token-ring and Ethernet network for connecting to the equipment operating at the speed of a Synchronous Optical Network (SONET) OC-1 or T3 circuit.

Routing Protocol

The OfficeServ 7400 supports the 'routing information exchanging' protocol to react to network environmental change and to effectively process the routing.

- Routing Information Protocol version1 (RIPv1), RIPv2
These protocols are widely used for managing the routing information in a mid-size independent network such as a group of LANs.
- Open Shortest Path First version2 (OSPFv2)
This routing protocol is used prior to the RIP in a large-size independent network. A router detects and reports any change in the routing table or the network to other routers. In this way, all routers share the same routing information.
- BGP4 (Border Gateway Protocol 4)
As an Exterior Gateway Protocol through which the Autonomous System (AS) sends/receives the routing information between other networks, Version 4 of BGP is currently used. BGP4 uses various matrixes when selecting the optimized path to the destination. BGP4 compares each matrix having priority and selects the optimized path.

Multicast Routing

- **Internet Group Management Protocol (IGMP)**
Internet Group Management Protocol (IGMP) protocol manages the multicast group operating at one Ethernet segment. It controls the segment so that a user can subscribe or secede as a member of the specific multicast group.
- **Distance Vector Multicast Routing Protocol (DVMRP)**
Distance Vector Multicast Routing Protocol(DVMRP) protocol supports the transmission of multicast data in a network. This protocol sends the multicast data in a unicast packet format, and the packets are reassembled into multicast data at the destination. DVMRP can be operated in various network formats, including Ethernet, and can even be operated via routers that do not support multicast data.
- **Protocol Independent Multicast-Sparse Mode (PIM-SM)**
PIM-SM is designed to route multicast packets into multicast groups and to construct the allocation tree efficiently at WAN. This optimizes the number of data streams that can occur in this environment.

Routing between VLAN Groups

Communication between VLAN groups is done through routing between the groups.

HTBQ/Bandwidth on Demand (BoD)

The queuing process is differentially performed according to the level table where the routing process priority for a data server is defined.

RTP Priority

The RTP (Real-Time Transport Protocol) packet is a VoIP media packet. The queuing process for the RTP packet is prior to that for other data packets, which helps to maintain the tone quality. This function is useful when using the VoIP function in a network where the VoIP packet that should be processed in real time and other packets for general office work are mixed.

IP-ToS Process

This function checks the ToS (Type of Service) field of the IP header and processes it according to priority of the corresponding routing in the data server. This function reproduces the ToS field flowing into the data server, performs the routing process first of all, and heightens the process priority in the next HOP.

4.2.3 Security

NAT/PT (In/Out/Exclusive/Redirect)

The security function supports the conversion function between the private IP address and public IP address in the network where security is required.

The Inbound, Outbound, Exclusive, and Redirect functions are supported.

- Inbound: Performs the forwarding process for the packet flowing from the WAN to the IP and port of the LAN specified in the NAT/PT conversion table.
- Outbound: Converts the IP address of the transmitter into the global IP address according to the NAT/PT conversion table for transmitting the packet from the LAN to the WAN.
 - Exclusive: Used for the IP address that is not applied by the NAT/PT conversion.
 - Redirect: When the Domain Name Server (DNS) server IP in the data server management sector is changed, each IP terminal uses the pre-DNS IP and this function changes the DNS IP by registering the post-DNS IP into the Redirect table

Firewall

- Access filtering

Prevents access to disallowed IP addresses to control access for the resource non-disclosed to the outside and to control the external resource which the membership in the LAN may access.
- DMZ function

Used for connecting the web server and mail server (which are firewall-protected LAN networks but need to be freely accessed from the outside) to the subnet separated from the LAN network where firewall blocking is not applied. In this way, access from the outside can be smoother with the access control service through the firewall.
- Port Forwarding

This function is similar to the DMZ function but is used for connecting to a specific network without a separately divided DMZ port. It is used for the extra network services as well as the DMZ function. The extra network is configured for a party outside of the office to access the Intranet in the office through the Internet. In this network, security on the Intranet is paramount.

Intrusion Detection System (IDS)

This function monitors packets on the network and detects those which can adversely affect network operation, making the network more stable. IDS is divided into various types from a detection type, where a specific type of attack is detected, to the abnormal traffic detecting type; these are based on the Snort Rule (www.snort.org) which defines the intrusion pattern and types. The detected packets are sorted and processed into Close connection/port or service disable/Alarm/log, based on the intrusion pattern and the level. In the case of an alarm, the system will notify the system administrator immediately.

Virtual Private Network (VPN)

- **VPN function**
The system provides the virtual private network function using the Internet open network. The VPN gateway function is based on the IPSec (IPSecurity), which is used to build the enterprise network with reduced cost and enforced security using the public network (such as the Internet) rather than the dedicated network.
- **VPN Tunnel Mode**
VPN functions are processed by establishing a tunnel through the VPN gateways between the OfficeServ 7400 data servers. Up to 100 VPN channels are available for one VPN.
- **PPTP**
PPTP is a tunnelling protocol for using the IP-based network. PPP encapsulates the data by wrapping the data with a PPP header. PPTP reconfigures the packets by adding a Generic Routing Encapsulation (GRE) header and IP header to this so that the packets can be transmitted via the IP network.
- **L2TP**
L2TP protocol combines PPTP and Layer 2 Forwarding (L2F). It encapsulates a user PPP frame (a Layer 2 frame) in an additional message called L2TP and then transmits it to the device connected to the public network, such as IP, X.25, frame relay, or Asynchronous Transmission Mode (ATM).

4.2.4 Data Server Applications Functions

DHCP

The OfficeServ 7400 can assign the IP address using DHCP. When using the DHCP server in another subnet, the OfficeServ 7400 supports the DCCP relay function. The IP address of equipment connected to the OfficeServ 7400 can be managed easily.

SIP Aware ALG (SIP Application Gateway)

This function is used for recreating packets for smooth communication by checking the SIP signal process packets according to the NAT/PT table in the data server. When using the system data server, SIP equipment can operate regardless of the packet blocking caused by the firewall or the NAT/PT conversion.

Outside ALG Interface

This function enables an outside application to retrieve or control information such as NAT/PT conversion information, firewall blocking information, and VPN tunnel information processed in the data server. It allows control packets used for H.323, VoIP networking, and IP phones operating on the Call server, to be smoothly serviced without blocking.

Network Load Balancing (NLB)

Network Load Balancing (NLB) has two purposes: NLB and Failover. The NLB function extends system bandwidth by automatically distributing the network traffic to external networks if there is more than one external network. The Failover function normalises network communication via another external network if a link failure occurs in part of the external network. In other words, network communication is always available unless a link failure occurs in all external networks.

System Management Interface

This function allows the administrator to report and manage alarm, event, traffic, and logging information, including IDS information, using the system administrator package through TCP/UDP. Reporting can be optionally specified based on the management data type.

Management Functions (Web/CLI/SNMP/RMON)

- CLI: Used for configuring the data server function using the CLI (Command Line Interface) on the Telnet.
- Web: The administrator can configure and view the operation of the data server functional block using the web browser.
- SNMP: SNMP agent collects and stores device information according to the specification (MIB) installed and determined at each network device. The SNMP manager manages the overall network by collecting the information from SNMP agents distributed around the network.
- Remote Monitoring (RMON): Network traffic can be checked and analyzed via 4RMON groups (history, statistics, alarms, events).

4.3 UMS Functions

The OfficeServ 7400 provides the Unified Messaging System (UMS) which includes the auto answering, voice message, and integrated e-mail message management functions. VoIP UMS processes the call signal using the VoIP module, which has the SIP protocol for the interface to the voice switch, and transmits the media through the RTP protocol of the TCP/IP. Accordingly, OfficeServ 7400 has superior architecture for capacity expansion and is cost effective, since there is no need for the physical interface required for the existing UMS or VMS.

4.3.1 Auto Attendant

Announcement Replay and Auto Call Forward

- This system replays the announcement when a calling party is connected to the auto attendant. This announcement can be specified based on holidays, working hours, or non-working hour.
- The auto call forward connects a calling party to the desired subscriber's station when the calling party dials a station number in the auto attendant. In this case, the call routing function will be also provided: this detects whether the entered phone number is valid, or that the length of the phone number can be changed.

Announcement Auto Change Based on the Schedule

Allows the administrator to automatically change and replay the announcement based on holidays, working hours, and non-working hours.

Announcement Change by Telephone

Allows the administrator to change the announcement by interfacing to the auto attendant from a remote site.

Call Forwarding to the Mailbox on the Busy Line

When a calling party interfaces to the auto attendant and tries to connect the call to a busy station, the called party on the busy station can use this function to forward the call to the voice mailbox.

Queuing Process on the Busy Line

When a calling party interfaces to the auto attendant and tries to connect a call to a busy station, and the 'Call Forwarding to the Mailbox on the Busy Line' function is not set (see above), a 'please hold' message is played and the connection is retried for a specified time. If the line continues busy after the maximum retry time, another voice message is provided asking the caller to either forward the call to the voice mailbox or hang up.

Direct Connection to the Mailbox

Allows access to the auto attendant and, using a prefix, directly connects the call to the mailbox of a specific subscriber rather than trying to connect the call to the subscriber's station.

Time Control for the Announcement

Allows the administrator to control the maximum recording time for an announcement when recording it for the auto attendant.

Cutting off Announcements when Digits are Entered

If the caller enters the number of the target station while an announcement is played in the auto attendant, the system stops the announcement and processes the entered digits.

Announcement Replay

Allows the administrator to listen to multiple pre-recorded voice announcements on a specific telephone.

4.3.2 General Functions Related to Voice Mail

Subscriber Authentication and Auto Login

- When a subscriber tries to login to the mailbox, this function checks the password in order to prevent unauthorised access. The mailbox number and password are entered and checked in sequence.
- When a calling party directly connects a call to the mailbox using the key number of the mailbox on the station phone, the system uses the auto login function to require only the password, without the mailbox number, since the UMS server knows the caller's phone number. The user can enter their mailbox number and connect a call to the mailbox using a hot key (speed key) on the telephone.

Voice Message Record/Replay/Store/Delete/Re-Send/Reply

- A caller can make a call to a mailbox and leave a voice message. The caller can send the message at a specific time (Send reservation) or listen to their recorded message and record again.
- A subscriber can log in to their own mailbox and listen to voice messages, including the message recording time, calling number and caller ID. The subscriber can delete the message, forward it to another party or group, or reply to the message.
- The subscriber can delete all messages currently stored in the mailbox.

Voice Message Pause/Play Continue/Next Play/Previous Play/Play Again

The subscriber can pause the current message, play the next or previous messages, or play the current message again.

New Message Auto Replay

The subscriber logged in to the mailbox can optionally set whether to automatically replay new voice messages.

Setting the Maximum Message Number for a Mailbox

This function is used for specifying the maximum number of messages for a mailbox. The corresponding announcement is provided.

Setting the Maximum Time for Storing Messages

The system automatically deletes voice messages after a specific time if the subscriber does not delete messages after listening to them. The subscriber can specify the time for auto message deletion.

Setting the Maximum Message Length

This function is used to set the maximum length of time available for an individual message. If the caller records a message of greater length the recording will automatically stop and the voice announcement 'Message recording is completed' is played.

Announcement Change based on the Schedule

This function automatically changes the announcement based on holidays, working hours, or non-working hours.

Voice Message Notice

A new voice message is notified to the subscriber on the LCD screen or by a flashing LED on the phone.

Private Mailbox Management

The subscriber can record, listen to, and delete the name of the private voice mailbox or change the password of the private voice mailbox. They can also record, listen to, and delete the greeting of the private voice mailbox.

4.3.3 Additional Functions Related to Voice Mail

Answering Machine Emulation (AME)

This function is similar to the auto answering machine. If a called party does not receive the call, it is forwarded to the AME. In this case, the called party can listen secretly to the forwarded call or reply to the call using the function key.

Call Back to the Caller ID/Call Number

This function allows subscribers to call back using the Caller ID or called number (a telephone number left with a voice message).

Voice Message Notification

The UMS can directly connect a new voice message to the subscriber's station rather than notifying the subscriber via the phone's LCD screen or LED. The subscriber can listen to the new message by picking up the handset.

Call Record

This function allows the subscriber to record a call in their voice mailbox while the call is in progress. A digital phone has a hot key which the subscriber can press to record. Analogue phone users should log in to the web and click the corresponding button to use this function.

Private Voice Memo

This function allows the subscriber to record information such as a schedule or telephone number by voice memo. This function is similar to the general voice message function except that the voice memo can be separately managed.

Stop the Private Mailbox Function

This function allows the subscriber to stop the private mailbox function. If a party tries to access the prohibited mailbox, a message will be displayed notifying that this mailbox cannot be used.

4.3.4 E-mail General Functions

Inbox

Allows the subscriber to read stored mail.

- **List View**
View the list of mail stored in Inbox. This functional button is displayed only when two frames are selected as 'mail reading frame' when setting the environment.
- **Modify**
Modify and forward read mail. This functional button is displayed only in Draft Folder.
- **Reply**
Reply to read mail.
- **Forward**
Forward the currently read mail to another subscriber.
- **Delete**
Forward read mail to Deleted Folder. To permanently delete mail, move into Deleted Folder and select the 'Delete' function.
- **Reject Receipt**
Reject mail from the sender of the currently read mail. If the Reject Receipt button is clicked, a message will be displayed notifying that the address of the party of the currently read mail is added to the Receipt Reject list.
- **Transfer the Mail to another Box**
Forward the read mail to another box. This functional button is not displayed in Draft Folder since the mail stored in Draft folder cannot be transferred to other boxes.

Compose

Allows the subscriber to write and send mails.

- **To:**
Enter the address of the receiver in this field. Up to six addresses can be entered. When entering multiple addresses, put a comma between each address., e.g.
abc@samsung.co.uk, def@samsung.co.uk, ghi@...
If the address of the receiver has already been registered, select it from the address list.
- **Cc:**
Enter the addresses of those who will refer to the mail. Up to six addresses can be entered. Refer to the 'To' field above.
- **Subject**
Enter the subject of the mail. Up to 128 characters can be entered.

- **Text**
Write the text of the mail. Up to 2 Gbyte is available for a mail.
- **Original Text**
Displays the text of the originally received mail. This is displayed only when replying to the original mail or transferring the original mail.
- **Attachments**
Specify the number of files to append. Up to 10 files can be appended and the capacity is unlimited. Enter the number of files to append and click the button. A message is displayed asking for the file(s) to append.
- **Attachment 1**
Enter the target file name in the empty field or click the 'Find' button to select a file saved on the PC.
- **Copy Message to 'Sent Folder'**
Store the sent mail in 'Sent Folder'.
- **Append Signature**
Send the mail with the sender's signature attached. The signature can be specified by the server administrator when creating a mail account. The account user later can change the signature. To change the signature, click the corresponding button.
- **Send**
Send the mail after writing.
- **Save Draft**
Temporarily store the mail in Draft while writing. The subscriber can modify the contents of the mail in Draft.

Deleted Folder

Allows the subscriber to temporarily store deleted mails. If mails stored in the Deleted folder are then deleted, deletion is permanent.

Draft

Temporarily store a mail while writing.

Mailbox List

Manage the private mailbox list such as Inbox, Sent Items, Deleted Items, and Draft folders.

Mailbox Creation

- Specify the name of a newly created mailbox (up to 32 characters).
- Enter the name in the 'Create New Mailbox' field and click 'Add'. Verify that the message notifying that the mailbox is correctly created is displayed and the name is displayed in the 'User Mailbox' list on the upper part of the screen.

Mailbox Change/Removal

Change or delete the existing mailbox.

8 Address List

This function allows the subscriber to create an address list

Select Group

Select an address group to change the name or delete the address.

- Change Group Name
- Delete Group Name
- Select All
Select all addresses from the address list. If this function is enabled, all the addresses will be checked.
- Selection Cancel
Cancel address selection. If this function is enabled, the checked addresses will be unchecked from the address list.
- Delete Address
To delete an address, select it and click the 'Delete' button.
- Transfer Address
Change the address group.
- Add Address
Add new addresses. If this item is clicked, a separate window will be displayed.
- A~Z
Retrieve addresses starting with a specific character from the address list.

External Mail Importing

The subscriber can import mail from other accounts into the OfficeServ 7400 mail account. For instance, mail from accounts in sites such as 'Yahoo' and 'Naver' can be read in the OfficeServ 7400 mailbox by registering the site(s) in the 'External Mail Management' item.

- External mail address
Enter the external mail address to register (e.g. jjkim@yahoo.co.uk)
- External mail server name
Enter the external mail server name to register (e.g. yahoo.co.uk)
- User ID
Enter the user ID to access an external mail (e.g. jjkim)
- Password
Enter the password to access an external mail.
- Protocol
Select the protocol type for the external mail server. To find the protocol type, access the corresponding server.
- Leaving the original message
The subscriber can leave the original message in the external mail account when setting an external mail to be read in the current mail account. To execute this function, Select 'Yes'.

Mail Receipt Rejection

The subscriber can register the corresponding mail ID to automatically cut off undesired mail such as junk mail. In this case, the system automatically rejects mail receipt.

- Enter the e-mail address for mail receipt rejection (e.g. abc@shopping.com)

Mail Filtering

When new mail arrives, the system can filter it according to specific words used as the sender name, receiver name, notice, or subject and then send it to a separate mailbox.

- Filter addition
The subscriber can specify the filtering criteria.

SMTP Sending Interface

The system supports the Simple Mail Transfer Protocol (SMTP) as an E-mail sending protocol.

POP3 Receive Interface

The system supports the Post Office Protocol 3 (POP3) as an E-mail receiving protocol.

IMAP4 Receive Interface

The system supports the Internet Message Access Protocol version 4 (IMAP4) as an E-mail receiving protocol.

15 Web Mail Interface

The system provides subscriber and administrator services for e-mails via the web browser.

4.3.5 Additional Functions Related to E-mail

User Account Management

The administrator can retrieve or delete an E-mail user and register a new user.

Mailbox Capacity Management

The system can restrict the storage capacity of the mailbox and display an alarm signal when the assigned capacity is exceeded.

Notice Management

The E-mail user can register or change the notices in his/her work group.

Logo Management

The user can register a screen, or change a screen in his/her work group, for the web login screen.

4.3.6 Integrated Messaging

Notifying the Voice Mail as the E-mail

When a new voice mail arrives, the system converts it into a file format such as WAV, MP3, or OGG, and then appends the converted voice mail to an e-mail.

New E-mail Notice

This function notifies the arrival of a new e-mail with a message on the LCD screen of the digital phone (or by a flashing LED).

The Unified Messaging System (UMS) optionally dials the subscriber's station to notify them that a new e-mail has arrived.

Reporting and Playing New E-mails

When a new e-mail arrives, the UMS dials the subscriber's station and reports the mail information using the Text-To-Speech (TTS) function.

- Mail information includes the total number of mails and the number of new mails. The subscriber can listen to the list of the mail's subjects or to the text of a mail.
- The subscriber can log in to the mailbox and listen to mailbox information with the mailbox key number.
- If the e-mail is in HTML format, the system extracts the text of the mail to report it using TTS.

4.3.7 UMS Management

Database Backup and Recovery

The user can back up or recover the Unified Messaging System (UMS) database.

- For backup, the database should be compacted as a file in a specific directory. This compacted file can be sent to an external computer.
- There are two types of backup:
 - Auto backup - The system automatically executes the backup periodically.
 - Manual backup - The user can back up on the web when needed.

Mailbox Management

The mailbox administrator can add or delete mailboxes. This function can be executed on a telephone. The mailbox administrator can retrieve the mailbox information on the web.

Voice Text Upload/Download

The user can upload audio text to the external computer from the system, or download it to the system from the external computer. It is used as the announcement for OfficeServ 7400.

Alarm Information Management

The user can specify the alarm level (Major, Minor) for alarms in the UMS and view the alarm information that has been generated over a specific period.

Operational Information Management

The user can view information such as the currently busy channel status and web login history.

Voice CODEC Selection

The user can specify the CODEC format for voice files.

- Select the voice CODEC (WAV, MP3, OGG) to be appended while sending mails.
- Select the voice CODEC (G.711, G.729) to be appended while creating the TTS.

4.4 Web/System Management

The OfficeServ 7400 provides the user interface for managing various system functional blocks on the web through the web browser. The system performs call server configuration management and information retrieval through OfficeServ Manager. The system also monitors the operational status of the functional blocks in the system.

4.4.1 Web Management

Database Backup

The user can back up the database for the data server and feature server through the web. (The call server database cannot be backed up.) Since database backup is actually executed in the feature server, the user can only use regular menus when the feature server is operating.

Follow the steps below to perform backup, download, upload, and recovery.

- Back up the database file in the /home/dbbackup directory of the feature server.
- The name of the backup file should be in the 'module name_date_hour.tar' format; e.g. /home/dbbackup/MS_20030620_145632.tar
- Collect the MS_*.tar, US_*.tar, SS_*.tar, and DS_*.tar files in the /home/database directory into one 'tar' file and send it to the web client (e.g. FSDB_20030620_142310.tar)
- Upload the database file of the web client into the feature server.
- Restore the database file in the /home/database directory of the feature server to the system.

User Information

The user can view user names and e-mail IDs for each station. The mailbox number is the same as the corresponding station number. If a subscriber forgets his/her password, the administrator can reset the password. (The default password is the phone number.)

Server Information

The user can view information (IP address, web port, IPC port) for each server module (call server, data server, feature server, system administrator) via this function.

VoIP Web Manager

This function displays or changes the setting status for VoIP services.

Data Server Web Manager

This function displays or changes the setting status for data services.

Voice-Mail Web Administrator

This function displays or changes the setting status for voicemail services.

E-mail Web Manager

This function displays or changes the setting status for e-mail services.

4.4.2 System Management

Multi Site Management

The user can enter and manage information (addresses, phone numbers, notes, system installation date, administrator, etc.) on the site where the OfficeServ 7400 is installed.

Integrated System Management

The user can view the current status (operational status, alarm information, etc) of the system in real time. The user can also manage each functional block (call server, data server, or feature server) using OfficeServ Manager or by connecting the web servers of the corresponding server.

Configuration Management

The configuration information for OfficeServ 7400 can be displayed as follows:

- OfficeServ 7400 unit configuration
- OfficeServ 7400 version information
- Data function setting/version information
- NAT information
- Feature server (UMS, mail) function setting/version information

Event Management

This function displays various event information such as critical errors or warnings generated in the system. The user can group events by arranging or searching events.

Access Log Management

This function displays the access log for the OfficeServ 7400. The user can group each access log by arranging and searching logs.

Traffic Management

The user can view traffic information generated in the system for a specific period (telephone usage, the amount of data transmitted and received, VoIP call processing, mail transmission/receipt) via this function. This information can be used for statistical analysis.

Station Message Detail Recording (SMDR)

The SMDR can be saved and viewed. This feature is sometimes referred to as Call Detail Record (CDR).

ABBREVIATIONS

A

AA	Auto Attendant
AC	Alternating Current
ALG	Application Level Gateway
AME	Answering Machine Emulation
AOM	Add-On Module
AP	Access Point
AS	Autonomous System
ASIC	Application Specific Integrated Circuit
AWG	American Wire Gauge

B

BoD	Bandwidth on Demand
BRI	Basic Rate Interface

C

CBQ	Class Based Queuing
CDR	Call Detail Record
CID	Caller Identification
CLI	Command Line Interface
CODEC	Coder/Decoder
CRC	Cyclic Redundancy Code
CSMA/CD	Carrier Sense Multiple Access/Collision Detect
CTI	Computer-Telephony Integration

D

DASL	Digital Adaptor for Subscriber Loop
DC	Direct Current
DHCP	Dynamic Host Configuration Protocol
DID	Direct Inward Dialling
DLI	Digital Line Interface
DMZ	DeMilitarized Zone
DNS	Domain Name Server
DPIM	Door Phone Interface Module
DSL	Digital Subscriber Line
DSP	Digital Signal Processor
DTMF	Dial Tone Multi Frequency
DVMRP	Distance Vector Multicast Routing Protocol

E

EAP	Extensible Authentication Protocol
EMI	Electro-Magnetic Interference

F

FE	Fast Ethernet
FXO	Foreign Exchange Office
FXS	Foreign Exchange Station

G

GK	GateKeeper
GND	Ground
GPLIM	Gigabit PoE LAN Interface Module
GSIM	Gigabit Switch Interface Module
GWIM	Gigabit WAN Interface Module

H

HDB3	High Density Bipolar of order 3
HDLC	High-level Data Link Control
HSSI	High Speed Serial Interface

I

IDS	Intrusion Detection System
IGMP	Internet Group Management Protocol
IMAP4	Internet Message Access Protocol version 4
IP	Internet Protocol
IPC	Inter-Processor Communication
IPSec	Internet Protocol Security
ISDN	Integrated Services Digital Network
ITU	International Telecommunication Union

K

KDB	Keyset Daughterboard
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L

L2TP	Layer 2 Tunnelling Protocol
LAN	Local Area Network
LCD	Liquid Crystal Display
LCR	Least Cost Routing
LED	Light Emitting Diode
LIM	LAN Interface Module
LP40	Local Control Processor

M

MFM	Multi-Frequency Module
MIS	Miscellaneous module
MMC	Man Machine Communication
MP40	Main Control Processor
MPD	Metering Pulse Detection

N

NAT	Network Address Translation
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O

OSM	OfficeServ Manager
OSPF	Open Shortest Path First

P

PCM	Pulse Code Modulation
PFT	Power Fail Transfer
PIM-SM	Protocol Independent Multicast-Sparse Mode
PLIM	PoE LAN Interface Module
PoE	Power over Ethernet
POP3	Post Office Protocol 3
PPP	Point to Point Protocol
PPPoE	PPP over Ethernet
PPS	Pulse Per Second
PPTP	Point to Point Tunnelling Protocol
PRI	Primary Rate Interface
PRS	Polarity Reverse Signal
PSTN	Public Switched Telephone Network
PSU	Power Supply Unit

Q

QAM	Quadrature Amplitude Modulation
QoS	Quality of Service

R

RCM	R2 Caller identification Module
RF	Radio Frequency
RMON	Remote Monitoring
RTP	Real-time Transmission Protocol
RTPR	Real-time Transmission Protocol Receiver
RTPT	Real-time Transmission Protocol Transfer

S

SIP	Session Initiation Protocol
SLI	Single Line Interface
SMDR	Station Message Detail Recording
SME	Small Medium Enterprise
SMTP	Simple Mail Transfer Protocol
SONET	Synchronous Optical Network
STP	Signalling Transfer Point

T

TAPI	Telephony Application Programming Interface
TEPRI	T1 E1 Primary Rate Interface
ToS	Type of Service
TRK	Trunk
TTS	Text-To-Speech

U

UA	User Agent
UART	Universal Asynchronous Receiver and Transmitter
UDP	User Datagram Protocol
UMS	Unified Messaging Service
USB	Universal Serial Bus
UTP	Unshielded Twisted Pair

V

VDSL	Very high bit rate Digital Subscriber Line
VLAN	Virtual Local Area Network
VMS	Voice Mail System
VoIP	Voice over Internet Protocol
VPM	Voice Processing Module
VPN	Virtual Private Network

W

WAN	Wide Area Network
WBS	Wireless Base Station
WIM	WAN Interface Module
WIP	Wireless IP
WLAN	Wireless Local Area Network
WLI	Wireless LAN Interface

